# CHAPTER 6.0 ENVIRONMENTAL CONSEQUENCES

This chapter evaluates the impacts and benefits of alternative approaches to dredged material disposal and reuse in the San Francisco Bay/Delta Estuary (the Estuary). First, in section 6.1, disposal and reuse in the three placement environments (ocean, in-Bay, and upland/wetland reuse [UWR]) are generically evaluated in terms of impacts and benefits associated with high, medium, and low overall volumes of dredged material. This evaluation is the last screening step for constructing the final alternatives carried forward for consideration. The final alternatives are each combinations of ocean, in-Bay, and upland/wetland reuse that differ by the relative volumes of dredged material that would go to each environment, and therefore by the degree to which beneficial reuse versus in-Bay or ocean disposal would be emphasized. The three final alternatives, along with the No-Action alternative, are compared and evaluated in section 6.2.

## 6.1 "GENERIC ANALYSIS" OF THE THREE PLACEMENT ENVIRONMENTS

As described in Chapter 3 (Dredging and Dredged Material Characteristics — An Overview) and Chapter 4 (Affected Environment), there are fundamental differences between the in-Bay, ocean, and upland environments in terms of the kinds of resources that may be affected by dredged material placement, the potential exposure pathways through which adverse effects may occur, and the opportunities to achieve environmental benefits by using dredged material as a resource rather than simply disposing of it as a waste. This section compares the three basic placement environments in light of these overall differences. The comparison is presented on an overall (not project-specific) basis to help identify the degree to which different levels of disposal activity in each type of placement environment should be included in the final alternatives carried forward for full evaluation. Therefore, this "generic analysis" represents the final step in the alternatives development process.

The important differences between the three basic placement environments, in terms of the potential environmental impacts and benefits of dredged material, are summarized in the sections that follow. In most cases, significant adverse environmental impacts would be avoided under any of the action alternatives, based on application of existing state and federal environmental laws and regulations, and the policy-level mitigation measures described in Chapter 5. Significant adverse environmental impacts are those that, for example, would result in the violation of an applicable federal or state environmental criterion, standard, or objective (e.g., for water or air quality); would cause the loss or substantial decrease in the local or regional population of a fish, wildlife, or plant species; or would jeopardize the continued existence of a state or federally listed special status or candidate fish, wildlife, or plant species, or substantially or adversely affect the critical habitat of such species. Even though potential adverse impacts would not generally be considered "significant" as defined above, various degrees of potential adverse impacts could still occur to different resources, depending on the alternative.

Throughout the evaluations that follow, the benefits and impacts of disposing of dredged material in the three placement environments are described on a relative basis. For example, the degree of actual adverse impacts to Estuary resources that is associated with current volumes of in-Bay dredged material disposal is impossible to accurately quantify with existing scientific information. The degree of impact from the other potential levels of disposal represented by the different alternatives also cannot be precisely quantified. This EIS/EIR therefore generally evaluates the alternatives in terms of the relative *risk* of adverse impacts occurring. Absolute impacts and benefits are discussed where appropriate. Benefits are described as "high benefit," "moderate benefit," "low benefit," or "negligible benefit." Risks and impacts are similarly described as "high risk/impact," "moderate risk/impact," "low risk/impact," or "negligible risk/impact." The ratings below are used throughout the following sections to describe the relative degree of potential environmental benefit and risk/impact of each preliminary alternative to each resource of concern. (Definitions for "negligible," "low," "moderate," and "high" benefit and risk/impact ratings differ with each resource, and are discussed in the section evaluating each resource.)

| ***Relative Rankings*** | ***Negligible*** | ***Low*** | ***Moderate*** | ***High*** |
|---|---|---|---|---|
| Benefit Rankings | 0 | +1 | +2 | +3 |
| Risk/Impact Rankings | 0 | -1 | -2 | -3 |

### 6.1.1 Water Quality Comparisons

Some degree of water quality impact will occur with disposal of dredged material in any of the placement environments, and at any disposal volume. Adverse water quality effects from ocean or in-Bay disposal could be associated with plumes from the initial disposal event, or in some cases from subsequent resuspension (from dispersive sites). In most cases such effects would be limited to the area of the plume following disposal, and would be temporary and localized. However, at higher disposal volumes there is a greater potential for some cumulative degradation of water quality to be associated with periods of high-frequency disposal (i.e., when multiple disposal events occur during a short time). No beneficial water quality effects are associated with unconfined ocean or in-Bay disposal of dredged material. Potential water quality impacts associated with upland/wetland reuse are more varied, and may be either adverse or beneficial depending on the type of reuse and the water body affected. The following paragraphs generally compare the potential water quality effects of disposal in the three placement environments. In all cases, the focus of this analysis is on disposal of the 80 percent of all dredged material assumed to be suitable for unconfined aquatic disposal ("SUAD" material).

The water quality impacts and benefits of high, medium, and low volumes of dredged material placed in each disposal environment are summarized in Table 6.1-1 and discussed in detail in the following sections.

#### 6.1.1.1 Ocean Disposal

*SF-DODS*

There are no beneficial water quality effects associated with ocean disposal of dredged material. Therefore, a "negligible benefit" rating (0) appears in Table 6.1-1 for all disposal volumes.

The potential for adverse water quality effects to result from ocean disposal of SUAD material at SF-DODS is also limited, even at relatively high disposal frequencies. As described in Chapter 4, both computer modeling and real-time field monitoring of disposal at SF-DODS have shown that disposal plumes dissipate quickly to background levels, and that this occurs entirely within the boundaries of the disposal site. Since SF-DODS is a depositional site (in contrast to in-Bay sites discussed below) disposed material is not expected to resuspend into the water column, and therefore would not continue to affect water quality after its initial disposal.

The expected frequency of disposal events at SF-DODS was estimated in the EPA site designation Final EIS at about 3 barge loads (of 5,000 cubic yards [cy] each) per day (EPA 1993a). This was based on an assumed 6 million cubic yards (mcy) of dredged material per year being disposed at the site. Six mcy was evaluated in EPA (1993a) because it represented all of the SUAD material predicted at the time to be dredged from the San Francisco Bay Area each year (75 percent of the estimated 8 mcy total per year). At that disposal volume the disposal frequency could be somewhat higher on occasion since, due to periods of extreme weather, the

**Table 6.1-1. Potential Benefits and Impacts to Water Quality, by Placement Environment and Disposal Volume**

| *Placement Environment* | *WATER QUALITY BENEFITS (a)* | | | *WATER QUALITY IMPACTS/ RISKS (b)* | | |
|---|---|---|---|---|---|---|
| | *High Volume* | *Medium Volume* | *Low Volume* | *High Volume* | *Medium Volume* | *Low Volume* |
| Ocean | 0 | 0 | 0 | -1 | 0 | 0 |
| In-Bay | 0 | 0 | 0 | -2 | -1 | 0 |
| **Upland/Wetland Reuse** | | | | | | |
| Habitat Restoration | +2 | +2 | +1 | -1 | 0 | 0 |
| Levee Maintenance | 0 | 0 | 0 | -1 | -1 | -1 |
| Rehandling Facility | 0 | 0 | 0 | -1 | 0 | 0 |

*Notes:* a. Benefits: +3 = High Benefit
+2 = Moderate Benefit
+1 = Low Benefit
0 = Negligible Benefit
b. Impacts/Risks: -3 = High Risk/Impact
-2 = Moderate Risk/Impact
-1 = Low Risk/Impact
0 = Negligible Risk/Impact

site may not be open for use at all times (there are no established seasonal site use restrictions at SF-DODS; however, the site designation final rule stipulates that barges may not be transported to the site when seas exceed 18 feet).

The overall disposal frequency at SF-DODS is expected to be less than estimated in EPA (1993a) for two reasons. First, LTMS has developed a revised, more realistic estimate of the total amount of material expected to be dredged over the next 50 years (see Chapter 3). The new estimate is approximately 6 mcy of dredged material per year (versus 8 mcy per year assumed in EPA [1993a]), and primarily reflects reduced dredging in the future as a result of military base closures. Based on this new, lower total, the quantity of SUAD material that is expected to be dredged is now estimated to be 4.8 mcy per year (80 percent of the 6 mcy total). Second, the LTMS agencies decided to consider a maximum of 80 percent of all SUAD material for disposal in any one placement environment, reflecting the need to have a diversity of disposal options available (see section 2.4). Therefore, this analysis assumes that an average of 3.8 mcy (80 percent of the 4.8 mcy of SUAD material) would actually be available for disposal at SF-DODS each year.

Assuming that the entire 3.8 mcy were directed to SF-DODS, this equates to an expected overall disposal frequency of 2 barge loads per day. If the frequency of site use occasionally tripled — to 6 disposal events on some days — water column plumes in some cases might not fully dissipate to background concentrations between disposal events, so that negligible-to-minor on-site cumulative water quality effects would be possible at times. These plumes would still dissipate within a matter of minutes to hours, within the disposal site boundaries, and would not result in federal water quality criteria being exceeded. Nevertheless, because some minor and temporary degradation of on-site water quality may occur during such higher-frequency use of the site, ocean disposal of high volumes of dredged material has been assigned a “low risk/impact” rating (-1) in Table 6.1-1.

At medium disposal volumes (2.4 mcy per year, or 50 percent of all SUAD material) and low disposal volumes (0.96 mcy, or 20 percent of all SUAD material), the frequency of disposal at SF-DODS would be even less. Plumes should fully dissipate between disposal events in almost all cases, and substantial periods of time may pass with no disposal activity at all. Disposal site use at these volumes is not expected to degrade on- or off-site water quality or to have any reasonable potential for cumulative impact. Therefore, a “negligible impact” rating (0) has been assigned in Table 6.1-1 to ocean disposal at medium or low volumes. It is important to note that even the very low degree of potential water quality impact identified for high volume use of SF-DODS would occur only within the boundaries of the disposal site; no adverse water quality effects are expected to occur outside the site boundaries, let alone in the Gulf of the Farallones National Marine Sanctuary or other sensitive areas.

*San Francisco Bar Channel*

The San Francisco Bar Channel ocean disposal site is not listed in Table 6.1-1 because its use and impacts do not vary with any of the scenarios being considered in this EIS/EIR. The dredging location and the disposal site are both located in a high energy environment outside the Golden Gate. The material disposed there is high quality (greater than 90 percent) sand dredged from the immediately adjacent channel, there are few fine particles, and the material is not expected to be a “carrier of contaminants” at concentrations of concern; thus the material meets testing exclusion criteria (40 CFR Part 227.13[b]). In addition, a limited volume of dredged material (approximately 650,000 cy/year) is disposed at the site on average. Finally, by federal rulemaking, the site may only be used by the COE for material dredged from the Bar Channel, and no change in these site use restrictions is anticipated. For these reasons, no adverse water quality effects are reasonably expected from continued use of the San Francisco Bar Channel disposal site.

### 6.1.1.2 In-Bay Disposal

As with ocean disposal, there are no water quality benefits associated with unconfined aquatic disposal at existing in-Bay sites. Water quality parameters identified in Chapter 4 as being of concern in terms of the potential for adverse impacts include dissolved oxygen, dissolved pollutant levels, ammonia and sulfides, and suspended solids/turbidity. Adverse changes to any of these parameters tend to be restricted to the immediate vicinity of the disposal plume; once plumes dissipate to background levels, immediate adverse water quality effects generally no longer exist. An exception is the South Bay, where water quality objectives are already exceeded (e.g., for copper), such that incremental additions would be problematic and the traditional concept of a mixing zone would not apply.

All of the existing in-Bay disposal sites — Suisun, Carquinez Strait, San Pablo Bay, and Alcatraz — are dispersive sites in shallow, estuarine waters (see Chapter 4). Compared to unconfined aquatic disposal at SF-DODS, there is greater potential for adverse water quality effects to be associated with disposal at any of the in-Bay sites. This is reflected in Table 6.1-1 as a higher environmental risk/impact rating for in-Bay versus ocean disposal. For example, some of the in-Bay sites are located in relatively restricted areas where initial disposal plumes can temporarily affect a substantial proportion of the embayment, or any fish migratory corridor within it (e.g., the Carquinez Strait site). In addition, subsequent resuspension of fine particles of dredged material from the sites can continue to affect water quality after the initial disposal event, incrementally increasing the overall suspended solids concentrations elsewhere in the embayment (e.g., the Alcatraz site). However, as with ocean disposal, the potential for in-Bay disposal to cause adverse water quality impacts is mainly associated with disposal frequency.

Compared to SF-DODS, there is a greater potential for high-frequency disposal to occur at in-Bay sites because of their proximity to dredging sites (faster turn-around time for barges from most projects), and because seasonal restrictions on dredging in some areas effectively forces multiple projects to dispose during limited time frames. Disposal frequencies have been quite high at times in the past. For example, between 1985 and 1987, an average of approximately 5 mcy per year was disposed at the Alcatraz site. On nearly two-thirds of the days during this period more than 10 disposal events occurred, and frequencies were occasionally as high as 41 disposal events per day (SFEP 1992b).

Under No-Action, almost all of the SUAD material would continue to be disposed at in-Bay sites, with the majority going to the Alcatraz site. Yearly and monthly disposal limitations have been placed on the in-Bay sites since amendments to the RWQCB's Regional Water Quality Control Plan were adopted in 1989. For Alcatraz, a yearly maximum of 4 mcy was established, with no more than 1 mcy per month allowed from October through April and no more than 300,000 cy per month allowed from May through September. Because of ongoing severe mounding problems at Alcatraz, additional limits were imposed on its use in Special Public Notice 93-3, published by the COE on February 1, 1993. PN 93-3 reduced the October through April monthly limits at Alcatraz to 400,000 cy from 1 mcy (the May through September limits of 300,000 cy remained unchanged, as did the overall yearly capacity of 4 mcy). In addition, no more than 150,000 cy during any month can be from clamshell dredging, and the COE reserves priority for the monthly capacity from February through May for its own maintenance dredging projects. Finally, up to 100,000 cy of dredged material proposed for Alcatraz (no more than 50,000 cy in any one month) can be redirected by the COE to the San Pablo Bay site if necessary. The Carquinez Strait site's annual capacity is set at 2 mcy in most years (3 mcy in above-normal water flow years), with no more than 1 mcy disposed in any month. The San Pablo Bay site's annual capacity is set at 500,000 cy, and the Suisun Bay Channel site's annual capacity is set at 200,000 cy (this site may only be used by the COE for sand from its maintenance dredging of the Suisun Channel).

At existing designated capacities, a total of 6.7 or 7.7 mcy per year could be disposed at the established in-Bay sites under No-Action. This is substantially greater than the LTMS revised long-term estimate of 4.8 mcy of SUAD material expected to be dredged over the next 50 years. However, even at the revised LTMS volume estimates, it is possible that the full monthly and annual capacity could be reached at any one of the existing in-Bay disposal sites in any given year. Therefore, the following evaluation of disposal frequency and potential water quality effects is based on worst-case disposal of the maximum monthly volumes allowed at each site. However, unlike disposal at SF-DODS where large 5,000-cy capacity ocean-going barges were assumed to be used, in-Bay disposal is expected to continue to occur using a mix of existing barge and hopper dredge capacities ranging from a few hundred cy up to 5,000 cy. For purposes of this general evaluation, a "typical" disposal load of 2,000 cy is assumed.

*Alcatraz Disposal*

At existing high disposal volumes, 400,000 cy per month could be disposed at the Alcatraz site during October through April, and 300,000 cy per month could be disposed during May through September. Therefore an average of approximately seven barge loads per day would dispose at the Alcatraz site during any one month from October through April, while an average of five barge loads per day would dispose at the site during any month from May through September. It is expected that daily disposal frequencies would be greater than this on occasion. If disposal frequency triples at times, as was assumed for SF-DODS above, then 21 disposal events per day would be expected at times from October through April, and 15 disposal events per day would be expected at times from May through September.[1] At these frequencies, initial disposal plumes may not always fully dissipate between disposal events, so that some cumulative degradation of Central Bay water quality could be expected. This is particularly true given that under PN 93-3 the COE has been successfully managing the site to minimize mounding by maximizing dispersion from the site. In addition, because of the dynamic nature of currents in the Central Bay, these plumes are not restricted to the immediate vicinity of the disposal site.

Since fish may avoid the area for 2 to 3 hours following a disposal event, cumulative effects on fish use of Central Bay may also occur during periods of high-frequency disposal (see section 6.1.2). Finally, dredged material particles may resuspend several times after their initial dispersion from the disposal site, incrementally increasing suspended sediment loads and turbidity levels throughout the Central Bay.

At medium overall in-Bay disposal volumes (2.4 mcy per year, or 50 percent of all SUAD material) the average frequency of disposal at the Alcatraz site would be less, but existing monthly site capacities could still occasionally be reached. At such times, the same potential water quality effects noted above could occur. However, this degree of use would not occur as regularly or as often, so that the overall potential for adverse effects to Central Bay water quality would be reduced. Perhaps more importantly, a medium overall disposal volume would allow for the possibility of reducing the monthly disposal limits at the site, so that occasional periods of high-frequency disposal could be better avoided. For example, even if the entire 2.4 mcy of dredged material were disposed only at the Alcatraz site, this could be accomplished by disposing at a rate of 200,000 cy per month year-around. This equates to an average of just over three barge loads per day. In addition, a reduction in the overall volume of in-Bay disposal means a reduction in the incremental contribution to the Central Bay's overall suspended sediment loads and turbidity levels. Nevertheless, absent any changes in the existing monthly disposal limits, some potential would remain for occasional high-frequency disposal and cumulative adverse water quality effects at medium overall disposal volumes.

At low disposal volumes (0.96 mcy, or 20 percent of all SUAD material), high-frequency disposal events, and cumulative water quality effects, would be even easier to avoid. The incremental contribution to overall suspended sediment loads and turbidity levels would be negligible.

*Carquinez Strait Disposal*

Federal maintenance dredging of the Mare Island channel has historically generated the majority of the dredged material disposed at the Carquinez Strait disposal site. The U.S. Navy's Mare Island Naval Shipyard was the primary facility for which this dredging was performed. The recent closure of the Mare Island Naval Shipyard has significantly reduced the need for dredging at this location, since the remaining navigation interests in the area do not require -36-foot channel depths. Consequently, the channel was not maintenance dredged in 1995, and it is unclear when it will next be dredged or the volume of material that will need to be removed. Nevertheless, as a worst case, the following evaluation is based on disposal occurring at the full existing designated capacity of the Carquinez Strait disposal site.

The Carquinez Strait disposal site can receive as much as 1 mcy of dredged material in any one month (but a yearly maximum of 2 or 3 mcy depending on the year). This equates to an average of approximately 17 disposal events per day. If actual disposal frequency triples on occasion, then as many as about 50 disposal events per day could occur at times.[2] Such disposal frequencies, occurring in the relatively constricted waters where this disposal site is located, have the potential to cause some cumulative degradation of water quality, particularly in Carquinez Strait and Mare Island Strait. Given the importance of the Carquinez Strait as a migratory corridor for several sensitive fish species, including salmon and striped bass, the RWQCB's 1989 Basin Plan amendments provide for restricting disposal at this site in the spring and fall (see section 6.1.2 below).

At medium overall in-Bay disposal volumes (2.4 mcy per year, or 50 percent of all SUAD material) the average frequency of disposal at the Carquinez Strait site would be less, but existing monthly site capacities could theoretically still be reached on occasion. In this event, potential water quality effects as described above could still occur, but on a less frequent basis. Given the site's distance from many of the major dredging projects elsewhere in the Estuary, it would be highly unlikely for projects that have traditionally used other disposal sites to be redirected to the Carquinez Strait site. Therefore, a reduction of overall in-Bay disposal would allow for the possibility of reducing the monthly site limits at the Carquinez Strait site, so that occasional periods of high-frequency disposal could be better avoided. Nevertheless, some potential would remain for cumulative adverse water quality effects to occur. For these reasons, there is a small potential for direct or cumulative adverse water quality effects from disposal of medium volumes of "suitable" material at the Carquinez Strait site.

At low overall in-Bay disposal volumes (0.96 mcy, or 20 percent of all SUAD material) high-frequency disposal events at the Carquinez Strait site, and cumulative water quality effects, would generally be avoidable.

*San Pablo Bay Disposal*

The San Pablo Bay disposal site is authorized to accept a total of only 500,000 cy of dredged material per year. It is theoretically possible that this entire amount could be disposed at the site in a one-month period. In that case, water quality effects similar in degree to those described above for the Alcatraz site are possible during that one month (an average of about eight barge loads would be disposed at the site per day, versus seven for the Alcatraz site). However, the largest user of the site is typically the COE, for federal maintenance dredging of the Petaluma River "across the flats" channel, and this project is typically dredged only every 5 to 10 years. Since 1941 the project has been dredged seven times, with volumes ranging from 266,000 cy to 788,000 cy.[3] Other projects may also be authorized to use the San Pablo Bay disposal site during the same general timeframe as the COE; however, these projects are dredged infrequently, and/or the volumes associated with them tend to be low (see Chapter 4 and Appendix E). It is therefore considered to be very unlikely for high frequency disposal to occur at this site except on very rare occasions.

As is true for the other in-Bay disposal sites, the San Pablo Bay site is dispersive, and dredged material particles will therefore resuspend after their initial dispersion from the disposal site. However, huge volumes of sediment (100 to 250 mcy) naturally resuspend into the water column from San Pablo Bay's extensive shallows and mudflats. Since the total annual disposal capacity is only 500,000 cy, there is a negligible potential for direct or cumulative adverse water quality effects from disposal of SUAD material at the San Pablo Bay site.

*Suisun Bay Channel Disposal*

Unlike the other in-Bay disposal sites, the Suisun Bay Channel site is not a multi-user site. This site may only be used by the COE, for federal maintenance dredging of the Suisun Bay Channel. The use of the site is not expected to change under any LTMS alternative. The dredged material placed at this site is comprised of fine sand, disposal of which has less potential to degrade water quality than the silts and clays often disposed at the other in-Bay sites. In addition, the annual capacity of this site is small (200,000 cy), such that any direct water quality impacts would be temporary and localized, and cumulative effects would not be expected. Finally, since only one project is associated with this site, project-specific conditions can be developed to ensure that, overall, no significant water quality impacts would occur. For these reasons, there is a negligible potential for direct or cumulative adverse water quality effects from disposal of SUAD material at the Suisun Bay Channel site.

However, it should be noted that sand such as that dredged from the Suisun Bay Channel represents a valuable resource with existing markets. Commercial sand miners are active in the vicinity, and excavate the same kind of material from nearby natural shoal areas. Any cumulative water quality effects of these mining activities could be reduced if maintenance dredging of the Suisun Bay Channel could be coordinated with sand mining in such a manner that the total amount of sand mining from the nearby shoals is reduced.

*Overall In-Bay Risk/Impact and Benefit Ratings — Water Quality*

Since no direct water quality benefits arise from in-Bay disposal of dredged material, a "negligible benefit" rating (0) appears in Table 6.1-1 for all disposal volumes.

At high overall in-Bay disposal volumes there is a potential for some cumulative degradation of San Francisco Bay water quality to occur, due both to initial disposal plumes and to subsequent resuspension, especially during periods of high-frequency use of the Alcatraz and Carquinez sites. Because of this, in-Bay disposal of high volumes of dredged material has been assigned a "moderate risk/impact" rating (-2) in Table 6.1-1.

At medium overall in-Bay disposal volumes, the ability to manage disposal sites to avoid high-frequency disposal is increased. Nevertheless, some potential for high-frequency disposal and for cumulative water quality effects would remain, especially associated with the Alcatraz and Carquinez Strait sites. In-Bay disposal of medium volumes of dredged material has therefore been assigned a "low risk/impact" rating (-1) in Table 6.1-1.

At low overall in-Bay disposal volumes, the ability to manage disposal sites to avoid high-frequency disposal is greatest. In addition, the overall disposal volume would be such that neither direct nor cumulative adverse water quality effects would be expected. Therefore, in-Bay disposal of low volumes of dredged material has been assigned a "negligible impact" rating (0) in Table 6.1-1.

#### 6.1.1.3 Disposal at Upland/Wetland Reuse Sites

Placement of SUAD-class dredged material at upland, wetland, or reuse sites can have either beneficial or adverse effects on water quality, depending on the type of reuse and the specific circumstances at the placement site. The following paragraphs generally describe the kinds of water quality benefits and impacts that may be associated with different types of dredged material disposal or reuse. However, to determine whether and how potential benefits will actually be realized, and whether and how potential adverse effects can be avoided or minimized, a case-specific evaluation would need to be conducted prior to individual project implementation. Note that this discussion does not address temporary, construction-related water quality impacts that may be associated with any type of reuse. These would have to be addressed on a case-specific basis. This discussion also does not address water quality effects that would occur regardless of whether dredged material is used for a project. For example, to the extent that levees will be maintained with some source of fill material, impacts of maintaining levees *per se* are not evaluated. Similarly, if dredged material is proposed as fill in a construction project, only the unique effects of using dredged material would be addressed — not the overall impacts of building the construction project itself (such as changing surface water hydrology by placing fill for a new roadway). It is assumed that such non-dredged material impacts would be addressed separately by the project proposing to use dredged material as a fill source.

In terms of affecting water quality at upland, wetland, or reuse sites there are three kinds of dredged material projects: habitat (wetland) restoration; levee maintenance; and rehandling sites. Other specific types of dredged material reuse affect water quality in a manner similar to one of these three. The three types of projects differ from each other in terms of water quality effects as described below.

*Habitat Restoration*

When properly sited and designed, habitat restoration projects (particularly wetland restoration) can result in a net benefit to water quality by increasing sediment retention, filtration of pollutants, and shoreline stabilization. Such benefits are likely to be realized to some degree by any wetlands restoration project that is properly designed so that it results in a functioning wetland. But the potential benefits could be diminished if, for example, a tidal wetland project is over-filled so that appropriate elevations for wetland vegetation are not created. Adverse water quality effects of wetland restoration can also occur if projects are improperly sited or designed (see Chapter 4). These may include, for example, degradation of surface water quality associated with site runoff, degradation of groundwater quality due to leachate from the site, or increased tidal prism resulting in incrementally increased salinity in the adjacent water body. Project-specific siting and design considerations are particularly important to ensure that adverse water quality impacts are avoided. For example, leachate impacts can be avoided by ensuring that the site is not on top of an aquifer used for drinking water (see Companion Policies in Chapter 5).

A high overall volume of placement at upland/wetland reuse (UWR) sites (80 percent of all SUAD material, or 3.8 mcy per year) has the potential to achieve the greatest water quality benefit, because the greatest number and largest acreage of wetland sites would be restored. As detailed in Appendix N and section 4.4.3, it is assumed that 66 percent of this volume (~2.5 mcy per year) would be reused in wetland restoration projects. This equates to an assumed 17 or 18 new wetland restoration projects, as follows: a total of 16 mcy would be reused in two habitat restoration projects during the first 5 years; an additional 28 mcy would be reused in four other projects during the subsequent 10 years; and 82 mcy would be reused in 11 or 12 habitat projects, or one every 3 years, over the remaining 35 years. It is assumed that all the projects with moderate or high feasibility rankings (LTMS 1994f) would be restored. These projects would result in the restoration or creation of as many as 12,500 acres of wetlands for the region. The potential water quality benefits from this degree of wetlands restoration are considered to be moderate (+2), given that over 90 percent of the Estuary's historic wetlands have been destroyed. (However, other environmental effects would also occur: see, for example, Fish and Wildlife Habitat Comparisons [section 6.1.2] and Air Quality Comparisons [section 6.1.5].) At the same time, minor adverse effects (-1) to surface water and/or groundwater could occur since, at high placement volumes, it is assumed that at least some projects would be constructed in relatively sensitive areas.

At medium overall placement volumes (50 percent of all SUAD material, or ~2.4 mcy per year), 63 percent of this material (~1.5 mcy per year) would be used for wetlands restoration (see Appendix N and section 4.4.3). This equates to an assumed 10 new wetland restoration projects (two small projects in the first 5 years, two larger ones in the subsequent 10 years, and six over the remaining 35 years). These beneficial reuse projects would result in 7,225 additional acres of wetlands for the region. The potential water quality benefits from this degree of wetlands restoration are considered moderate (+2), given that over 90 percent of the Estuary's historic wetlands have been destroyed. At the same time, fewer projects would be constructed overall, so that relatively sensitive areas could more easily be avoided. Therefore, adverse effects to surface water and/or groundwater are expected to be negligible (0).

At low overall placement volumes (20 percent of all SUAD material, or ~1 mcy per year), 57 percent of this material (only ~0.55 mcy per year) would be used in wetland restoration projects (see Appendix N and section 4.4.3). In this case, it is assumed that only four new wetlands would be created (one small project in the first

5 years, one large project in the subsequent 10 years, and two large projects in the remaining 35 years). These projects would result in 2,812 additional acres of wetlands for the region. The potential water quality benefits from this degree of wetlands restoration is considered to be low (+1). At the same time, relatively sensitive areas should easily be avoidable. Therefore, adverse effects to surface water and/or groundwater are expected to be negligible (0).

*Levee Maintenance and Stabilization*

If high volumes of dredged material (80 percent of all SUAD material, or 3.8 mcy per year) are placed in UWR sites, it is assumed that 14 percent of this volume (~0.5 mcy per year) would be used for levee maintenance (see Appendix N and section 4.4.3). No direct water quality benefits (0) are associated with using dredged material (or any other source of fill) for levee maintenance, at any placement volume. Reuse of dredged material for levee maintenance can adversely affect water quality primarily by increasing the levels of dissolved constituents in surface runoff and groundwater. The potential for levee maintenance to have adverse effects on water quality depends in part on where the project occurs. There is the greatest potential for the reuse of dredged material for levee maintenance in the Delta; however, the Delta is also the most sensitive area in terms of water quality because drinking water standards generally apply throughout the area, and because of the presence of sensitive, special status species (see Chapter 4). Saline dredged material from the more marine portions of San Francisco Bay would not generally be used for levee maintenance in the Delta, and even material having compatible salinities would not be place on the outboard (river-facing) sides of levees (see Companion Policies, Chapter 5). In addition, placement of dredged material on delta levees would be subject to site-specific attenuation factors developed to ensure that beneficial uses are not degraded. Therefore, direct adverse water quality impacts to Delta rivers and sloughs are not expected. However, there still may be some cumulative adverse effects to water quality on the Delta islands associated with surface runoff and groundwater.

A limited volume of dredged material would be used and a limited number of levee miles would be maintained using dredged material (relative to all ongoing levee maintenance work). Therefore, assuming application of all relevant companion policies, there is a low potential for adverse water quality effects (-1) from reusing dredged material for levee maintenance.

At medium overall placement volumes (50 percent of all SUAD material, or ~2.4 mcy per year), the percentage assumed to be reused for levee maintenance increases to 22 percent; however, the same total volume (~0.5 mcy per year) would be reused under both medium and high scenarios (see Appendix N and section 4.4.3). Therefore, the potential for water quality benefits are negligible (0), and the potential for adverse water quality impacts at medium overall placement volume is low (-1), identical to that described above for high overall placement volumes.

At low overall placement volumes (20 percent of all SUAD dredged material, or ~1 mcy per year), 43 percent of this volume (~0.4 mcy per year) would be used for levee maintenance (see Appendix N and section 4.4.3). This is slightly less dredged material than would be reused under the high and medium overall placement volume scenarios, because other assumed UWR projects would leave somewhat less material available for levee reuse. Therefore, the potential for water quality benefits is negligible (0), and the potential for adverse water quality effects at low overall placement volumes is low, slightly less than described above for medium or high overall placement volumes.

*Rehandling Facilities*

No direct water quality benefits (0) are associated with dredged material rehandling facilities regardless of dredge material volume. Operation of rehandling facilities can affect either surface water quality or groundwater quality via runoff or leachate, as discussed under Habitat Restoration, above. If high volumes of dredged material (80 percent of all SUAD material, or 3.8 mcy per year) are placed in UWR sites, it is assumed that 20 percent (~0.75 mcy per year) would be processed at rehandling facilities (see Appendix N and section 4.4.3). One new moderate-size rehandling facility or two new smaller rehandling facilities would need to be constructed to process an average of ~0.75 mcy per year of SUAD material under a high overall placement volume scenario. (This is in addition to any facility[ies] constructed to rehandle the ~1 mcy per year of NUAD material assumed to be generated under all LTMS scenarios.) It is assumed that water management associated with operation of the additional rehandling facility(ies) will result in periodic discharges of return water on an ongoing basis. However, since only one or two additional facilities would be needed, most adverse water quality effects should be avoidable through application of appropriate siting and design measures. Nevertheless, there is a low risk or potential for some degradation of water quality (-1).

At medium overall placement volumes (50 percent of all SUAD material, or ~2.4 mcy per year), it is assumed that

16 percent of this volume (~0.4 mcy per year) would be processed at rehandling facilities (see Appendix N and section 4.4.3). At this volume, it is assumed that one additional rehandling facility would be required. In this case, most adverse water quality effects should be avoidable through application of appropriate siting and design measures, and adverse water quality effects should be negligible (0).

At low overall placement volumes (20 percent of all SUAD material, or ~1 mcy per year), no SUAD-class dredged material would be processed through rehandling facilities. Therefore, no additional rehandling facilities would be needed, and no adverse water quality effects would occur (0).

*Overall Upland/Wetland Reuse Risk/Impact and Benefit Ratings — Water Quality*

The greatest direct water quality benefits can be realized from the largest number of wetland restoration projects, and the largest number of wetlands would be created or restored at high overall placement volumes. Therefore, a “moderate benefit” rating (+2) has been assigned to the Habitat Restoration category of Table 6.1-1. At the same time, however, a minor degree of adverse water quality impacts is considered to be unavoidable for each of the different reuse types at high overall placement volumes. Therefore a “low risk/impact” rating (-1) has been assigned under the Habitat Restoration, Levee Maintenance, and Rehandling Facility categories in Table 6.1-1.

At medium overall placement volumes, some water quality benefits would occur as a result of wetlands restoration; a “moderate benefit” rating (+2) has therefore been assigned under the Habitat Restoration category in Table 6.1-1. There are also expected to be some minor unavoidable water quality effects associated with levee maintenance, since the same volume of dredged material would be reused on levees under both the high and medium overall placement volume scenarios. Therefore a “low risk/impact” rating (-1) has been assigned under the Levee Maintenance and Stabilization category in Table 6.1-1.

At low overall placement volumes, few wetlands sites would be restored, and water quality benefits would be minor. Table 6.1-1 reflects this with a “low benefit” rating (+1) for Habitat Restoration. Minor adverse water quality effects could still be associated with reuse of dredged material for levee maintenance, since only slightly lower volumes would be used relative to the medium and high overall placement scenarios. Therefore a “low risk/impact” rating (-1) has been assigned under the Levee Maintenance category in Table 6.1-1.

### 6.1.2 Fish and Wildlife Habitat Comparisons

Dredged material placement can have either beneficial or adverse effects on habitat quality for fish and wildlife. Chapter 4 discusses the fish and wildlife species and habitat types that may potentially be affected by placement of dredged material at ocean, in-Bay, and upland/wetland reuse sites.

Simple disposal of dredged material as a waste generally does not result in habitat benefits, and may have adverse effects depending on the site and the method of disposal. This can be true not only for unconfined disposal at ocean or in-Bay sites, but also when dedicated Confined Disposal Facilities (CDFs) or rehandling facilities are developed in existing upland or wetland locations for dredged material management. On the other hand, reuse of dredged material for habitat restoration, creation, or enhancement can have substantial environmental benefits that are significant to the region as a whole. Both open water aquatic habitat and upland or wetland habitats can be restored, enhanced, or created by reusing dredged material as a compatible, efficient source of fill or substrate. The following paragraphs compare the general potential for beneficial and adverse effects on fish and wildlife habitat quality that result from disposal and reuse of SUAD-class dredged material in the different placement environments. Note that, while dredged material can be reused for enhancement of open water aquatic habitat (for example, by restoring or creating appropriate depths for transplanting eelgrass or other submerged aquatic vegetation), the existing ocean and in-Bay sites discussed below are unconfined aquatic disposal sites as opposed to beneficial reuse sites. No new in-Bay or ocean sites are currently being proposed by LTMS; any new open water sites proposed for habitat restoration or enhancement would have to be evaluated separately. The following evaluation therefore focuses on the existing unconfined aquatic disposal sites, and does not address the potential effects of aquatic beneficial use sites on fish and wildlife habitat quality.

The fish and wildlife habitat impacts and benefits of high, medium, and low volumes of dredged material placement in each disposal are summarized in Table 6.1-2, and discussed in detail in the following sections.

#### 6.1.2.1 Ocean Disposal

*SF-DODS*

Disposal of dredged material at SF-DODS would not result in any direct fish or wildlife habitat benefits; therefore Table 6.1-2 includes “negligible benefit” ratings (0) in the high, medium, and low volume categories for ocean disposal. At high ocean disposal volumes some on-site benthic organisms would be directly smothered, while at medium and low disposal volumes, most on-site benthic organisms should be able to burrow through the thin dredged material deposit. However, at any disposal volume, physical alterations to benthic habitat at the disposal site will occur as a result of deposition of dredged sediments whose grain size and other physical characteristics differ from the natural sediments at the site. These physical changes could ultimately alter the mix of benthic infaunal species at the site. However, these changes would not affect any unique or limiting habitats, would only occur within the boundaries of the disposal site, and would affect only a very small proportion of the extensive, similar habitat throughout the region (see Chapter 4). Therefore, benthic habitat effects are considered to be negligible.

Potential adverse effects could occur to the fish and wildlife habitat in the water column, in relation to the temporary on-site water quality effects discussed above and as a result of disturbance due to disposal operations. However, water quality-related habitat effects would be temporary, and would be contained entirely on site. As discussed in section 6.1.1.1, high-frequency disposal activity that could potentially result in cumulative on-site water quality- or disturbance-related habitat degradation is not expected to occur. In addition, SF-DODS is not located in critical or limiting habitat for any species, so that any fish and wildlife that may occasionally avoid the site would not be expected to suffer adverse impacts from moving to another area. Nevertheless, there is some risk of occasional habitat quality degradation. Therefore, the same ratings assigned to ocean disposal under water quality (section 6.1.1.1) are also assigned in Table 6.1-2 to adverse effects on fish and wildlife habitat: a “low risk/ impact” rating (-1) at high disposal volumes, and a “negligible impact” rating (0) at medium and low disposal volumes.

*San Francisco Bar Channel*

The San Francisco Bar Channel ocean disposal site is not listed in Table 6.1-2 because its use and impacts do not vary with any of the scenarios being considered in this EIS/EIR. No fish and wildlife habitat benefits are associated with disposal at the San Francisco Bar Channel site. Similarly, no adverse water column or benthic habitat effects are expected to occur, since only sand from the immediately adjacent channel is disposed at the site, and this material is identical to the existing substrate at the site.

However, the material dredged from the San Francisco Bar Channel and disposed at the Bar Channel Site is high quality sand. This material is particularly suitable for reuse as beach nourishment material, or for other kinds of habitat restoration that need high quality sand (including sand dunes, or least tern nesting habitat). Habitat benefits could therefore be realized if nearby restoration projects are proposed that need this type of material, and if dredging of the Bar Channel could to be coordinated with them.

#### 6.1.2.2 In-Bay Disposal

Disposal of dredged material at existing, dispersive in-Bay disposal sites would not result in any direct fish or wildlife habitat benefits; therefore Table 6.1-2 includes “negligible benefit” ratings (0) in the high, medium, and low volume categories for in-Bay disposal. Adverse effects to water column habitat could occur in association

**Table 6.1-2. Potential Impacts and Benefits to Fish and Wildlife Habitat, by Placement Environment and Disposal Volumes**

| | FISH AND WILDLIFE HABITAT BENEFITS (a) | | | FISH AND WILDLIFE HABITAT IMPACTS/RISKS (b) | | |
|---|---|---|---|---|---|---|
| ***Placement Environment*** | ***High Volume*** | ***Medium Volume*** | ***Low Volume*** | ***High Volume*** | ***Medium Volume*** | ***Low Volume*** |
| Ocean | 0 | 0 | 0 | -1 | 0 | 0 |
| In-Bay | 0 | 0 | 0 | -2 | -1 | 0 |
| **Upland/Wetland Reuse** | | | | | | |
| Habitat Restoration | +3 | +2 | +1 | -3 | -1 | 0 |
| Levee Maintenance | 0 | 0 | 0 | 0 | 0 | 0 |
| Rehandling Facility | 0 | 0 | 0 | -1 | 0 | 0 |

*Notes*: a. Benefits: +3 = High Benefit b. Impacts/Risks: -3 = High Risk/Impact
-2 = Moderate Risk/Impact
-1 = Low Risk/Impact
0 = Negligible Risk/Impact
+2 = Moderate Benefit
+1 = Low Benefit
0 = Negligible

with water quality effects, as described above (section 6.1.1.2). In addition, there is the potential for adverse physical impacts on benthic habitats via grain size and other substrate changes if dredged material dispersed from in-Bay sites settles in areas with a different kind of natural substrate. In contrast to ocean disposal at the non-dispersive SF-DODS, such changes would not be restricted to the area within the site boundaries. The potential water column and benthic habitat impacts of in-Bay disposal at existing dispersive sites are discussed in the following sections.

*Water Column Habitat Effects*

The potential for disposal of dredged material at in-Bay sites to adversely affect water column fish and wildlife habitat is related to both water quality impacts, and to disturbance or displacement from important habitat areas, including migration corridors. As discussed above in section 6.1.1.2, there is a potential for cumulative water quality impacts associated with periodic high-frequency disposal activities at the dispersive in-Bay sites (particularly at the Alcatraz and Carquinez Strait sites). Cumulative water quality impacts would equate to cumulative degradation of water column habitat quality experienced by fish and wildlife near the disposal sites. In addition, disposal activities can cause temporary displacement of fish from the vicinity of the disposal site, especially during high-frequency disposal activity (whether due to cumulative water quality effects or due to the physical disturbance of disposal). For example, localized effects of this type have been documented around the Alcatraz disposal site, where behavioral avoidance of the area by some fish species was seen to last from 2 to 3 hours following disposal events. In worst-case situations where high-frequency disposal activities coincide with migration periods, this could effectively result in delays or disruptions to migration timing or routes. The risk of this kind of habitat effect resulting in an adverse impact is greatest at the Carquinez Strait disposal site due to its location in a constricted waterway through which fish migrating between the ocean or Bay and the Delta must pass.

The ability to minimize the potential for water column habitat quality effects depends upon the ability to avoid high-frequency disposal activities, or at least to minimize how often they occur. As discussed in section 6.1.1.2, periodic high-frequency disposal would be unavoidable at high overall in-Bay disposal volumes, and thus there is a moderate risk that cumulative effects would occasionally occur. At medium overall in-Bay disposal volumes there is a much greater ability to manage the existing disposal sites so as to minimize high-frequency disposal, although such events could still theoretically occur on occasion, so that a low risk of cumulative water column habitat quality impacts remains. At low overall in-Bay disposal volumes, high-frequency disposal events would be avoidable. In addition, substantial reductions in disposal at the Carquinez Strait disposal site would be expected. Therefore negligible cumulative impacts to water column fish and wildlife habitat would be anticipated.

*Benthic Habitat Effects*

Benthic habitat quality impacts would be more widespread and last much longer than impacts to water column habitat. As discussed in Chapter 4, the potential for adverse changes in benthic habitat quality is most pronounced in the Central Bay, where rocky shorelines, hard-bottom (reef) habitat, and extensive areas of coarse-grained (sandy) substrate naturally exist. These Central Bay habitats are vulnerable to alteration by deposition of fine-grained dredged material. The majority of all Bay Area dredged material continues to be disposed at the Alcatraz site, and the majority of this dredged material is composed predominantly (>80 percent) of fine silts and clays. In contrast, benthic habitats in the embayments most directly affected by fine grain size dredged material dispersed from the San Pablo Bay and Carquinez Straits disposal sites are predominantly fine-grained. Such areas are much less vulnerable to potential adverse habitat quality changes from dredged material.

At high overall in-Bay disposal volumes (particularly at the very high No-Action volumes), there is a moderate risk of continued adverse benthic habitat quality impacts, particularly in Central Bay associated with high-volume use of the Alcatraz disposal site. The active management necessary to minimize mounding at the Alcatraz site (to avoid increasing navigation hazards in this heavy traffic area), means that off-site movement of dredged material would be maximized. Various Central Bay Areas would thus continue to experience degraded benthic habitat quality, at least temporarily or periodically. At medium overall in-Bay disposal volumes, the degree of benthic habitat quality impact would be reduced to a relatively low level. However, some degradation of Central Bay benthic habitats could still occur, especially related to occasional periods of high-frequency use of the Alcatraz disposal site. During such periods, aggressive management to maximize dispersion and off-site movement of dredged material may still be necessary to avoid mounding. On the other hand, some benthic areas previously affected as a result of past high-volume disposal at the Alcatraz site could be expected to begin recovering as a result of natural flushing. At low overall in-Bay disposal volumes, it is expected that currents would be able to disperse sediments from the Alcatraz site without the need for aggressive management to minimize mounding. At the same time, the high energy currents of the rocky intertidal, reef, and sandy bottom habitats should be able to fully flush themselves at low overall disposal volumes. Therefore, effects to Central Bay benthic habitats outside of the Alcatraz disposal site itself are expected to be negligible.

*Overall In-Bay Risk/Impact and Benefit Ratings — Habitat*

A "moderate risk/impact" rating (-2) is shown in Table 6.1-2 for the high overall in-Bay disposal volume category. This degree of risk reflects the potential for cumulative effects to water column habitat quality related to water quality effects (section 6.1.1.1), and to some unavoidable adverse impacts to Central Bay benthic habitats including rocky intertidal, hard-bottom (reef), and sandy-bottom areas. At medium overall in-Bay disposal volumes the risk of adverse impacts is reduced, but adverse cumulative water column and benthic habitat effects could still possibly occur on occasion, particularly during periods of high-frequency disposal activity. A "low risk/impact" rating (-1) was therefore assigned in Table 6.1-2 to medium in-Bay disposal. There is a negligible risk of adverse impacts at low overall in-Bay disposal volumes, so a "negligible impact" rating (0) appears in Table 6.1-2.

### 6.1.2.3 Disposal at Upland/Wetland Reuse Sites

One of the most important overall tradeoffs addressed in this programmatic Policy EIS/EIR is the potential for placement of dredged material at upland or wetland reuse sites to result in significant benefits to fish and wildlife habitat, and at the same time for it to cause significant habitat impacts. In the San Francisco Bay/Delta Estuary, maximizing the environmental benefits that can be realized through appropriate reuse of dredged material as a resource can, to a large degree, only be accomplished through placement at upland or wetland reuse sites. Therefore, greater volumes of dredged material targeted for such sites theoretically means greater potential for environmental benefits. However, locations that would be the most feasible as reuse sites for dredged material — particularly sites that would be feasible for habitat restoration — often already provide some degree of important habitat values.

For example, as discussed in section 4.4, many farmed, diked historic baylands are subsided below sea level. These areas generally represent the most feasible locations to consider restoration of tidal salt marsh habitat using dredged material to restore appropriate elevations for the marsh vegetation. In doing so, important new acreages of habitat, including critical habitat for some species that are listed as special status, can be created. However, these diked historic baylands often already support some degree of valuable seasonal wetlands and other important habitats. Therefore, more upland or wetland reuse of dredged material does not necessarily mean maximizing *net* environmental benefits. The challenge is to maximize net environmental benefits by minimizing associated losses of other important, existing habitat values.

This challenge is made more acute because some degree of habitat tradeoff would be inevitable with almost any habitat restoration project using dredged material. Decisions need to be made about the relative value of existing habitat types (such as seasonal wetlands), and about the need for creation or restoration of different habitat types (such as tidal wetlands). These decisions — for example, whether restoration of tidal wetlands to support sensitive species, at a site that currently supports some acres of seasonal wetlands, would represent a net environmental benefit — must be made on a case-by-case basis. And the decisions could be different at different times: habitat that is needed and appropriate to restore at one location during a particular year, may no longer be needed or appropriate to restore at an adjacent site at a later time if other habitat types are regionally more valuable or limited by then. For these reasons, such decisions are best made in the context of a comprehensive resource management plan for the area involved. An important policy-level mitigation measure, common to all LTMS alternatives (see section 5.1.2.1), is that habitat restoration projects using dredged material must result in an overall net environmental benefit that is fully coordinated and consistent with the needs identified in resource management plans for any area.

Other kinds of upland or wetland reuse, including levee maintenance and stabilization, and the construction of rehandling facilities, have no direct fish and wildlife habitat benefits. Potential losses of existing habitat values are associated with these reuse categories. In the case of levees, the majority of the habitat losses are temporary, and would occur as a result of maintenance or stabilization regardless of whether dredged material is used as the source of fill. On the other hand, rehandling facilities (and other potential upland placement sites such as CDFs for NUAD-class material) would cause the permanent loss of existing habitat values with no offsetting on-site habitat restoration inherent in their operation. Such facilities would have to fully mitigate for all habitat losses associated with their construction and operation (see section 5.1.3).

Finally, reuse of dredged material at existing sites approved for other purposes such as landfills (for daily cover, cap, liner, or berms), or as fill in construction sites (such as roadway base material) are not evaluated below. It is assumed that any habitat loss or other impact associated with these kinds of projects would be addressed in the project's environmental documentation. However, in some cases the substitution of dredged material for other sources of fill can be of benefit in reducing overall cumulative effects. This would be the case, for example, at landfills where use of dredged material for daily cover or capping eliminates the need to excavate soil for these purposes from another location, where other impacts would otherwise occur.

The habitat benefits and impacts of placing SUAD-class dredged material at upland, wetland, or reuse sites are compared in the following paragraphs. In each case (high, medium, or low overall volumes), the evaluations are based on the relative percentages of the total volume that could reasonably be expected to be available for placement under each upland/wetland reuse category (see Appendix N and section 4.4.3).

*Habitat Restoration*

A high overall volume of UWR placement (80 percent of all SUAD material, or 3.8 mcy per year) has the potential to achieve the greatest fish and wildlife habitat benefit, because the greatest number and acreage of wetland sites would be restored. As described earlier in section 6.1.1.3, it is assumed that 66 percent of this volume (~2.5 mcy per year) would be reused in wetland restoration projects. This equates to an assumed 17 or 18 new wetland restoration projects, at all of the potential sites with moderate or high feasibility rankings (LTMS 1994f). These projects would result in the restoration or creation of as many as 12,500 acres of wetlands for the region. The potential habitat benefits from this degree of wetlands restoration are considered to be high (+3), given that over 90 percent of the Estuary's historic wetlands have been destroyed. (However, other environmental effects would also occur: see, for example, Water Quality Comparisons [section 6.1.2] and Air Quality Comparisons [section 6.1.5].) At the same time a substantial degree of adverse impact (-3) to existing habitats, including seasonal wetlands, could also occur since, at high placement volumes, some projects would be constructed in relatively sensitive areas. The term "relatively sensitive areas" can be defined as habitat that provides some value for estuary species, but is not considered high quality or does not provide the optimal habitat functions.

At medium overall placement volumes (50 percent of all SUAD material, or ~2.4 mcy per year), 63 percent of this material (~1.5 mcy per year) would be used for wetlands restoration (see Appendix N and section 4.4.3). This equates to an assumed 10 new wetland restoration projects. These beneficial reuse projects would result in 7,225 additional acres of wetlands for the region. The potential habitat benefits from this degree of wetlands restoration are considered moderate (+2), given that over 90 percent of the Estuary's historic wetlands have been destroyed. At the same time, fewer projects would be constructed overall, so that relatively sensitive areas could more easily be avoided. Therefore, adverse effects to fish and wildlife habitat are expected to be low (-1).

At low overall placement volumes (20 percent of all SUAD material, or ~1 mcy per year), 57 percent of this material (only ~0.55 mcy per year) would be used in wetland restoration projects (see Appendix N and section 4.4.3). In this case, it is assumed that only four new wetlands would be created, resulting in 2,812 additional acres of wetlands for the region. The potential habitat benefits from this degree of wetlands restoration is considered to be low. At the same time, relatively sensitive areas should easily be avoidable. Therefore, adverse effects to fish and wildlife habitat are expected to be negligible.

*Levee Maintenance and Stabilization*

Levees represent important habitats for a variety of wildlife species (see section 4.4). In general, maintenance and stabilization of levees can result in at least temporary losses of habitats that have developed at the toe (the base of the levee) and on the inside face of the levee since the previous maintenance occurred. These habitat effects are largely physical, and would occur regardless of whether dredged material were the source of fill used for the maintenance and stabilization.

A caveat to this is related to salinity. Dredged material from high-salinity areas would not generally be used for maintenance or stabilization of Delta levees. Some of the dredged material that could be reused (for example, from the Suisun Bay Channel) may also still have low levels of salinity that can affect plant re-establishment. Therefore some wildlife habitat quality effects may occur. However, only very small quantities of dredged material — an average of approximately 500,000 cy per year or less — are reasonably expected to be reused on Delta levees, under any of the upland/wetland reuse placement volume scenarios (see Appendix N and section 4.4.3). In contrast, the overall, long-term need for fill material to strengthen and stabilize to federal standards the 1,000+ miles of levees in the LTMS planning area is estimated to be between 50 and 100 mcy. Additional material may also be needed for long-term maintenance of these strengthened levees within the Delta and the lower reaches of the Estuary.

Compared to the degree of (temporary) habitat losses experienced at any one time due to maintenance and stabilization of levees using fill sources other than dredged material, the potential salinity-related habitat effects of reusing small quantities of dredged material on levees are considered to be negligible. Therefore a “negligible risk/impact” rating (0) has been assigned to levee maintenance and stabilization under high, medium, and low overall upland/wetland reuse volume categories in Table 6.1-2.

*Rehandling Facilities*

If high volumes of dredged material (80 percent of all SUAD material, or 3.8 mcy per year) are placed in UWR sites, it is assumed that 20 percent (~0.75 mcy per year) would be processed at rehandling facilities (see Appendix N and section 4.4.3). One new moderate-size rehandling facility or two new smaller rehandling facilities would be needed to process an average of ~0.75 mcy per year of SUAD material under a high overall placement volume scenario. (This is in addition to any facility[ies] constructed to rehandle the ~1 mcy per year of NUAD material assumed to be generated under all LTMS scenarios.)

At medium overall placement volumes (50 percent of all SUAD material, or ~2.4 mcy per year), it is assumed that 16 percent of this volume (~0.4 mcy per year) would be processed at rehandling facilities (see Appendix N and section 4.4.3). At this volume, it is assumed that one additional rehandling facility would be required.

At low overall placement volumes (20 percent of all SUAD material, or ~1 mcy per year), no SUAD-class dredged material would be processed through rehandling facilities. Therefore, no additional rehandling facilities would be needed, and no adverse fish and wildlife habitat effects would occur.

*Overall Upland/Wetland Reuse Risk/Impact and Benefit Ratings — Habitat*

Overall, a substantial wildlife habitat benefit would result from upland or wetland reuse of dredged material at high overall placement volumes. This benefit is associated entirely with the volume of dredged material that would be available for habitat restoration (as opposed to use on levees or at rehandling facilities), and would primarily result from tidal wetlands restoration rather than from other kinds of habitat restoration. A “high benefit” rating (+3) is therefore shown for Habitat Restoration in Table 6.1-2 under high volume placement, while “negligible benefit” ratings (0) are shown under Levee Maintenance/Stabilization and under Rehandling Facilities, at high, medium, and low overall disposal volumes. On the other hand, a relatively large loss of existing habitat values would be associated with this scenario, as well, since some sensitive existing habitats (including seasonal wetlands) could not be avoided. This loss would come about primarily as a result of the relatively large number of habitat restoration projects; therefore, a “high risk/impact” rating (-3) is shown for Habitat Restoration under the high volume placement category in Table 6.1-2. However, the construction of two additional rehandling facilities would also result in a permanent loss of some existing habitat; a “low risk/impact” rating (-1) is thus assigned in Table 6.1-2 under this category. A “negligible risk/impact” rating (0) is assigned under the high volume category for Levee Maintenance/ Stabilization, because only very limited volumes of dredged material would be used.

At medium overall placement volumes a substantial number of new wetlands acres would still be created. This is shown as a “moderate benefit” rating (+2) under Habitat Restoration in Table 6.1-2. At the same time, enough sites with relatively low existing values for habitat restoration would be available at this overall placement volume to avoid adversely affecting the most sensitive existing habitats. Therefore a “low risk/impact” rating (-1) has been assigned to Habitat Restoration at medium placement volumes. One additional rehandling facility would be needed at medium overall placement volumes; however, sensitive habitats should be fully avoidable. Therefore a “negligible risk/impact” rating (0) has been assigned in Table 6.1-2.

At low placement volumes a degree of habitat restoration would still occur but it would be reduced, as reflected in the “low benefit” rating (+1) under this category in Table 6.1-2. Sensitive habitats should be almost entirely avoidable at low placement volumes, however, and no additional rehandling facilities would be needed. Therefore, a “negligible impact” rating (0) is assigned under each of these categories in Table 6.1-2.

### 6.1.3 Special Status Species Comparisons

Dredged material placement can have either beneficial or adverse effects on special status species and their habitat. Chapter 4 discusses the special status species that may be affected by dredged material placement at ocean, in-Bay, and upland/wetland reuse sites. The degree of potential benefit or impact to special status species is generally

**Table 6.1-3. Potential Impacts and Benefits to Special Status Species, by Placement Environment and Disposal Volume**

| *Placement Environment* | *SPECIAL STATUS SPECIES BENEFITS (a)* | | | *SPECIAL STATUS SPECIES IMPACTS/RISKS (b)* | | |
|---|---|---|---|---|---|---|
| | *High Volume* | *Medium Volume* | *Low Volume* | *High Volume* | *Medium Volume* | *Low Volume* |
| Ocean | 0 | 0 | 0 | -1 | 0 | 0 |
| In-Bay | 0 | 0 | 0 | -1 | 0 | 0 |
| **Upland/Wetland Reuse** | | | | | | |
| Habitat Restoration | +3 | +2 | +1 | -1 | 0 | 0 |
| Levee Maintenance | 0 | 0 | 0 | 0 | 0 | 0 |
| Rehandling Facility | 0 | 0 | 0 | 0 | 0 | 0 |

*Notes*: a. Benefits: +3 = High Benefit
+2 = Moderate Benefit
+1 = Low Benefit
0 = Negligible Benefit
b. Impacts/Risks: -3 = High Risk/Impact
-2 = Moderate Risk/Impact
-1 = Low Risk/Impact
0 = Negligible Risk/Impact

related to the overall degree of habitat benefit or impact discussed for all fish and wildlife species, as discussed above in section 6.1.2.1.

Simple disposal of dredged material as a waste at ocean or in-Bay sites does not result in benefits to special status species, and may have adverse effects depending on the site and the method of disposal. This can be true not only for unconfined disposal at ocean or in-Bay sites, but also when dedicated CDFs or rehandling facilities are developed in existing upland or wetland locations for dredged material management. On the other hand, reuse of dredged material for habitat restoration, creation, or enhancement can have substantial benefits to special status species that can be significant to the region as a whole.

The potential impacts and benefits to special status species at high, medium, and low volumes of dredged material placement in each disposal environment are summarized in Table 6.1-3 and discussed in the following sections.

### 6.1.3.1 Ocean Disposal

*SF-DODS*

Disposal of dredged material at SF-DODS would not result in any direct benefits to special status species; therefore Table 6.1-3 includes “negligible benefit” ratings (0) in the high, medium, and low volume categories for ocean disposal. Potential adverse effects could occur to water quality, and therefore to water column habitat, in relation to the temporary on-site water quality effects discussed previously and as a result of disturbance due to disposal operations. However, such effects would be temporary, and would be contained entirely on site. As discussed in section 6.1.1.1, high-frequency disposal activity that could potentially result in cumulative on-site water quality- or disturbance-related habitat degradation is not expected to occur. Therefore adverse impacts are not expected to any species, including special status species. In addition, SF-DODS is not located in critical or biologically limiting habitat, so that any special status fish and wildlife species that may occasionally visit the site would not be expected to suffer adverse impacts from moving to another area. Nevertheless, there is some risk of occasional habitat quality degradation. Therefore, the same ratings assigned to ocean disposal under water quality (section 6.1.1.1) and to fish and wildlife habitat (section 6.1.2.1) are also assigned in Table 6.1-3 to adverse effects on special status species: a “low risk/impact” rating (-1) at high disposal volumes, and a “negligible impact” rating (0) at medium and low disposal volumes.

*San Francisco Bar Channel*

The San Francisco Bar Channel ocean disposal site is not listed in Table 6.1-3 because its use and impacts do not vary with any of the scenarios being considered in this EIS/EIR. No benefits to special status species are associated with disposal at the San Francisco Bar

Channel site. Similarly, since only sand from the immediately adjacent channel is disposed at the site, and this material is identical to the existing substrate at the site, no adverse water column or benthic habitat effects are expected to occur that might result in adverse effects on special status species.

However, the material dredged from the San Francisco Bar Channel and disposed at the Bar Channel Site is high quality sand. This material is particularly suitable for reuse as beach nourishment material, or for other kinds of habitat restoration that need high quality sand (including sand dunes, or least tern nesting habitat). Habitat benefits to some special status species could, therefore, theoretically be achieved if nearby restoration projects are proposed that need this type of material, and if dredging of the Bar Channel could to be coordinated with them.

### 6.1.3.2 In-Bay Disposal

Disposal of dredged material at existing, dispersive in-Bay disposal sites would not result in any direct benefits to special status species; therefore Table 6.1-3 includes "negligible benefit" ratings (0) in the high, medium, and low volume categories for in-Bay disposal. Adverse effects to water quality (section 6.1.1.1), and to water column habitat in association with water quality effects (section 6.1.1.2), could theoretically affect special status fish species, especially if high-frequency disposal events occurred during migration periods. The risk of this kind of effect resulting in an adverse impact to special status species is greatest at the Carquinez Strait disposal site due to its location in a constricted waterway through which fish migrating between the ocean or Bay and the Delta must pass. However, application of policies common to all LTMS alternatives would ensure that disposal at in-Bay sites, including the Carquinez Strait site, would not occur during critical time frames, at rates or frequencies that could jeopardize any special status species (see section 5.1.2.2). For this reason, the effects of in-Bay disposal on special status species are considered to be low (-1) at high volumes, and negligible (0) at all other overall disposal volumes; a "negligible impact" rating (0) is therefore assigned in Table 6.1-3.

In some instances, the act of dredging itself has the potential to cause adverse impacts to special status species of fish and wildlife if it occurs at times or in areas where these species are present. Dredging may also physically impact important habitats used by these species (for example, if widening slough channels results in the loss of cordgrass habitat for the California clapper rail). Although the alternatives analysis does not evaluate the effects of dredging itself because the alternatives do not vary the amount of dredging, a policy-level mitigation measure has been developed in coordination with the resource agencies to facilitate the permitting process (see section 5.1.2.2).

### 6.1.3.3 Disposal at Upland/Wetland Reuse Sites

As discussed in section 6.1.2.3 for fish and wildlife habitat in general, the reuse of dredged material for habitat restoration at upland or wetland reuse sites can result in significant regional benefits to special status species. At the same time, it can cause adverse impacts if habitat restoration measures for one species result in the loss of habitat for other species. The habitat benefits and impacts of placing SUAD-class dredged material at upland, wetland, or reuse sites are compared in the following paragraphs.

*Habitat Restoration*

In the Estuary, maximizing the benefits to special status species that can be achieved through appropriate reuse of dredged material can primarily be accomplished through placement at upland or wetland reuse sites. Therefore, greater volumes of dredged material targeted for such sites theoretically means greater potential for direct benefits to special status species. However, locations that would be the most feasible as reuse sites for dredged material — particularly sites that would be feasible for habitat restoration — may at times already support some use by special status species, or provide important related habitat values.

A high overall volume of UWR placement (80 percent of all SUAD material, or 3.8 mcy per year) has the potential to achieve the greatest benefits to special status species, because the greatest number and acreage of wetland sites would be restored. As detailed in Appendix N and section 4.4.3, it is assumed that 66 percent of this volume (~2.5 mcy per year) would be reused in wetland restoration projects. This equates to an assumed 17 or 18 new wetland restoration projects over the 50-year planning period. It is assumed that all the projects with moderate or high feasibility rankings (LTMS 1994f) would be restored, resulting in the restoration or creation of as many as 12,500 acres of wetlands for the region. The potential habitat benefits for special status species from this degree of wetlands restoration are considered to be high, given that over 90 percent of the Estuary's historic wetlands have been destroyed. At the same time, some adverse impacts to existing habitats could also occur. However, the protection for special status species habitat under the federal and state Endangered Species Acts are stronger than those for non-special status species under other acts, and impacts to existing special status species habitat would have to be avoided to the maximum extent possible. Projects that would result in the direct loss of special status species habitat generally would not be permitted if less environmentally damaging alternatives were possible, or if an overall net benefit to the same species or habitat would not ultimately result. Therefore, impacts to special status species at high overall upland/wetland reuse placement volumes would be less than could occur to other kinds of fish and wildlife habitats at the same placement volumes. Overall, adverse effects to special status species and their habitats are expected to be low.

At medium overall placement volumes (50 percent of all SUAD material, or ~2.4 mcy per year), 63 percent of this material (~1.5 mcy per year) would be used for wetlands restoration (see Appendix N and section 4.4.3). This equates to an assumed 10 new wetland restoration projects over 50 years. These beneficial reuse projects would result in 7,225 additional acres of wetlands for the region. The potential benefits from this degree of wetlands restoration are considered moderate, given that over 90 percent of the Estuary's historic wetlands have been destroyed. At the same time, fewer projects would be constructed overall, so that relatively sensitive areas could more easily be avoided. Therefore, adverse effects to special status species and their habitats are expected to be negligible.

At low overall placement volumes (20 percent of all SUAD material, or ~ 1 mcy per year), 57 percent of this material (only ~0.55 mcy per year) would be used in wetland restoration projects (see Appendix N and section 4.4.3). In this case, it is assumed that only four new wetlands would be created, resulting in 2,812 additional acres of wetlands for the region. The potential habitat benefits from this degree of wetlands restoration is considered to be low. At the same time, relatively sensitive areas should easily be avoidable. Therefore, adverse effects to special status species and their habitats are expected to be negligible.

*Levee Maintenance*

Levees represent important habitats for a variety of wildlife species, including some that are special status species (see section 4.4). No direct benefits to special status species would occur as a result of reusing dredged material for levee maintenance and stabilization. In general, maintenance and stabilization of levees can result in at least temporary losses of habitats that have developed at the toe and on the inside face of the levee since the previous maintenance occurred. These habitat effects are largely physical, and would occur regardless of whether dredged material were the source of fill used for the maintenance and stabilization. However, only very small quantities of dredged material — an average of approximately 500,000 cy per year or less — are reasonably expected to be reused on Delta levees under any of the upland/wetland reuse placement volume scenarios (see Appendix N and section 4.4.3). The degree of habitat impact associated with use of this volume of dredged material on levees was identified in section 6.1.2.3 as being negligible for fish and wildlife overall; impacts to special status species or habitat would be even less because special efforts would be made to avoid them.

*Rehandling Facilities*

At high overall upland/wetland reuse placement volumes, two additional rehandling facilities would need to be constructed. At medium overall placement volumes one additional facility would be needed, while no additional facilities would need to be constructed under the low volume scenario. Unlike some kinds of habitat restoration projects, rehandling facilities do not necessarily need to be located in diked historic baylands or similar areas that are likely to support some sensitive habitats.

No direct benefits to special status species or habitats are expected from construction or operation of these facilities. Special efforts would have to be made to avoid and minimize any loss or adverse impact to special status species or their habitats by these facilities. However, since only two facilities would be needed at high overall placement volumes, and only one at medium volumes, most impacts should be avoidable. Any unavoidable impacts would have to be fully mitigated. Therefore, the potential for adverse impacts to special status species or their habitats as a result of construction and operation of rehandling facilities for SUAD-class dredged material is considered to be negligible at any overall placement volume.

*Overall Upland/Wetland Reuse Risk/Impact and Benefit Ratings — Special Status Species*

Overall, a substantial benefit to special status species and their habitats would result from upland or wetland reuse of dredged material at high overall placement volumes. This benefit is associated entirely with the volume of dredged material that would be available for habitat restoration (as opposed to use on levees or at rehandling facilities), and would primarily result from tidal wetlands restoration rather than from other kinds of habitat restoration. A "high benefit" rating (+3) is therefore shown for Habitat Restoration in Table 6.1-2 under high volume placement. At the same time some adverse effect to special status species could occur, to the extent that some existing special status species habitat could not be avoided. Every effort would be made to minimize and mitigate for any adverse effect, however. Therefore a “low risk/impact” rating (-1) has been assigned under Habitat Restoration in Table 6.1-3.

No direct special status species benefits would be associated with levee maintenance and stabilization or with construction or operation of additional rehandling facilities at any placement volume. Therefore “negligible benefit” ratings (0) are shown under these categories in Table 6.1-3 for high, medium, and low volumes. Similarly, adverse impacts to special status species from levee maintenance and stabilization and from additional rehandling facilities should be avoidable and/or fully mitigable at all disposal volumes. Therefore a “negligible risk/impact” rating (0) has been assigned under the high, medium, and low overall upland/wetland/reuse volume categories in Table 6.1-3.

At medium overall placement volumes, moderate special status species benefits would be associated with habitat restoration, so a “moderate benefit” rating (+2) is assigned to this category in Table 6.1-3. However, because fewer restoration projects would occur at this volume, adverse impacts to special status species should be avoidable. Table 6.1-3 therefore includes a “negligible risk/impact” rating (0) under this category.

At low overall upland/wetland/reuse placement volumes, some habitat restoration projects benefiting special status species would still occur. A “low benefits” rating (+1) is assigned to this category in Table 6.1-3. Also, adverse impacts should be even more avoidable that under the medium volume scenario (“negligible risk/impact” rating [0]).

### 6.1.4 Transportation System Comparisons

The transportation system needed to move dredged material to disposal or reuse sites, and the potential impacts associated with movement of dredged material via these systems, can differ depending on the placement environment, on the specific disposal or reuse site, and on the kind of end use for which the dredged material will be used. Impacts associated with increased traffic volumes, noise, and use of the transportation systems themselves (e.g., increased repairs to roadways heavily used by trucks) may all occur under certain circumstances. Specific transportation methods, any significant impacts associated with their use, and new facilities (such as roads, railways, or channels) that may be needed to support a particular disposal or reuse site must therefore be evaluated on a case-by-case basis.

Similarly, project-specific mitigation measures would have to be developed for any adverse effects identified. Site- and project-specific assessments of these kinds are outside the scope of this programmatic Policy EIS/EIR. However, there are general differences between the placement environments. The general transportation-related impacts of high, medium, and low volumes of dredged material placement in each disposal environment are summarized in Table 6.1-4 and discussed in detail in the following sections. No transportation-related benefits are expected to occur under any scenario; a “negligible benefit” rating (0) has therefore been assigned in all categories in Table 6.1-4.

#### 6.1.4.1 Ocean Disposal

*SF-DODS*

Dredged material disposed at SF-DODS would almost always be transported via large-capacity (4,000- to 5,000-cy capacity) bottom-dump barges towed by ocean-going tugs. This system is a very effective method of transporting large quantities of dredged material in terms of vessel traffic and related impacts, because no rehandling is required (dredged material is placed directly into the barges at the dredging site) and a minimum number of vessel trips is needed overall. This in turn minimizes the potential for collisions and resulting spills, compared to transportation of dredged material for disposal at in-Bay sites. However, the potential for inclement weather to result in spillage, or loss of a barge and its load, are higher for vessels outside the Golden Gate compared to vessels that remain within the Estuary. In addition, radar coverage by the U.S. Coast Guard's Vessel Traffic System (VTS) does not extend all the way to SF-DODS.

Barges used to transport dredged material to SF-DODS may not be loaded so full that seas expected during the period of transit to the disposal site could cause spillage of the dredged material. In addition, vessels may not depart from San Francisco Bay for the SF-DODS when waves exceed 18 feet. Because of these provisions of the site designation rulemaking, and the low expected disposal frequencies at the site (an average of approximately two disposal events per day, see section 6.1.1.1), transportation- related impacts of ocean disposal at SF-DODS are expected to be negligible under each of the high, medium, and low overall volume scenarios — a "negligible risk/impact" rating (0) in Table 6.1-4.

*San Francisco Bar Channel Site*

The disposal site for material dredged from the San

**Table 6.1-4. Potential Benefits and Impacts Associated with Transportation Systems, by Placement Environment and Disposal Volume**

| | ***TRANSPORTATION SYSTEMS BENEFITS (a)*** | | | ***TRANSPORTATION SYSTEMS IMPACTS/RISKS (b)*** | | |
|---|---|---|---|---|---|---|
| ***Placement Environment*** | ***High Volume*** | ***Medium Volume*** | ***Low Volume*** | ***High Volume*** | ***Medium Volume*** | ***Low Volume*** |
| Ocean | 0 | 0 | 0 | 0 | 0 | 0 |
| In-Bay | 0 | 0 | 0 | 0 | 0 | 0 |
| **Upland/Wetland Reuse** | | | | | | |
| Habitat Restoration | 0 | 0 | 0 | 0 | 0 | 0 |
| Levee Maintenance | 0 | 0 | 0 | -3 | -3 | 0 |
| Rehandling Facility | 0 | 0 | 0 | -3 | -3 | 0 |

*Notes*: a. Benefits:
+3 = High Benefit
+2 = Moderate Benefit
+1 = Low Benefit
0 = Negligible Benefit
b. Impacts/Risks: -3 = High Risk/Impact
-2 = Moderate Risk/Impact
-1 = Low Risk/Impact
0 = Negligible Risk/Impact

Francisco Bar channel is immediately adjacent to the channel itself, so transport distance and any associated transportation-related effects are minimized. Dredging by the COE is conducted with a self-propelled hopper dredge, which is also a very effective method that does not require any rehandling. Since no changes to management of this site are proposed or anticipated under any of the LTMS scenarios, no adverse effects are expected.

#### 6.1.4.2 In-Bay Disposal

Like ocean disposal, the transportation of dredged material to in-Bay disposal sites is relatively efficient and effective. Both hopper dredges and bottom-dump barges are used, and rehandling is not required. However, overall vessel traffic within the Estuary is much higher than outside the Golden Gate. In addition, a much higher frequency of disposal is associated with in-Bay sites, in part because smaller-capacity barges are often used and because dredging sites are nearer. Together, these result in additional trips to the disposal site and faster turnaround times from the dredging site, and ultimately higher-frequency disposal site use. Therefore transportation to and use of the existing unconfined aquatic disposal sites in the Estuary represents greater vessel traffic volume-related risks than does ocean disposal. However, the number of collisions, breakaways, and groundings involving barges and tugs, even under existing conditions (high in-Bay disposal), has historically been small (see section 4.2.5.1), so this risk is considered to be minor. At the same time, weather-related risks are less overall than for ocean disposal. Overall, transportation-related impacts of in-Bay disposal under each of the high, medium, and low volume scenarios are therefore considered to be negligible (0), as shown in Table 6.1-4.

#### 6.1.4.3 Disposal at Upland/Wetland/Reuse Sites

There is a potential for a variety of transportation-related adverse impacts associated with placement of dredged material at upland, wetland, or reuse sites. Impacts are primarily related to the need to rehandle the dredged material prior to its final placement, and to the logistics of accessing many upland/wetland/reuse sites.

In some cases, rehandling and access problems can be minimized, for example, when the dredging site is within pumping distance of the final placement or reuse site, hydraulic dredging can eliminate the need for rehandling. However, when sediments are dredged from locations within the Estuary that are far from the final placement area, they must initially be placed in a barge, then transported to an offloading facility where the dredged material is removed from the barge and handled separately to transport it to the disposal or reuse site. If barge access is available near the final disposal or reuse site, the dredged material can be pumped directly to the site fairly efficiently. However, if barge access is not possible near the final placement site, another intermediate rehandling step is needed (such as dewatering the material at a rehandling site prior to its excavation and transport to the final placement site).

When additional rehandling is necessary, traffic-related issues may become a first-order concern. Typically, dredged material can be brought to a rehandling facility relatively efficiently by barge. However, once dried, the material is generally excavated (using routine construction machinery such as bulldozers and front-end loaders) and placed into surface vehicles (trucks or train cars, depending on the location of the rehandling facility and the final placement site). While barges (even “small” shallow-draft barges that only carry 1,000 cy) are relatively efficient at moving large volumes of dredged material without causing other traffic-related impacts, trucks are particularly inefficient in this regard. A medium-size dump truck with a capacity of 10 cy would need to make 200 round trips to move one typical 2,000-cy barge-load of dredged material. Movement of large quantities of dredged material by truck therefore has the potential to generate substantial traffic-related impacts including increased traffic volumes, noise, emissions, and impacts to the transportation system itself (e.g., increased roadway repairs). Such impacts may be significant on a site-specific basis.

If the dredged material is moved by rail, the level of impact would be somewhere between the impacts of barging and the impacts of trucking.

The following assessment assumes that all of the SUAD-class dredged material that would go to rehandling facilities or to levees under any (high, medium, or low) scenario would be moved (after dewatering) via 10-cy trucks, while material used for habitat restoration sites would be directly placed without rehandling. (Larger [20+]-cy dump trucks are available; however, they could not be used in all cases because of access limitations at some disposal or reuse sites [such as many levees].) Two additional rehandling facilities are assumed to be needed at high overall placement volumes, and one at medium volumes (none would be needed at low volumes, so negligible additional transportation-related impacts would be expected). The assessment is considered to represent a worst reasonable case. Identified transportation-related impacts would be less, for example, if larger-volume trucks, or other higher-volume transportation methods such as rail cars, were used for some or all of the material or if more (smaller) rehandling facilities were used so that peaks in truck traffic could be staggered, and so that traffic would not all be focused on one or two locations.

At high overall UWR placement volumes (80 percent of all SUAD material, or about 190 mcy), 66 percent of the material (~125 mcy, or 2.5 mcy per year on average) would be placed directly into habitat restoration sites. The 14 percent going to levees (an average of ~500,000 cy per year) would be handled by barge, and the remaining 20 percent (~760,000 cy per year) would be rehandled via trucks. Allowing for 20 percent shrinkage as a result of drying, a total of 60,800 ten-cy truck loads per year would be required to move the resulting 608,000 cy of dredged material from the assumed two new rehandling facilities to final placement sites. If these two rehandling facilities had similar capacities such that each handled half this overall volume (~304,000 cy per year each), approximately 30,000 round-trip truck loads per year would occur at each site. This equates to an average of approximately 83 additional round trips per day, or approximately 3.5 trips per hour, every day of the year. However, truck traffic could actually be much higher than this at times, because the dredged material would generally be excavated and transported in batches after sufficient drying had occurred. The drying process can take several months, after which removal of the material would take place as quickly as possible in order to make room at the facility for the next batch of dredged material. It would be reasonable to expect that, during periods when the dredged material is being excavated and removed from the rehandling facility, average truck volumes could temporarily triple to as much as approximately 250 round trips per day or 10 round trips per hour, from each rehandling site. The potential traffic-related impacts of this volume of truck traffic, coming from each rehandling facility, could be significant depending on the location of and existing transportation system serving the specific rehandling sites.

At medium volumes going to upland, wetland, or reuse sites, one additional rehandling facility could produce the same worst-case traffic-related impacts as noted above, but at one site rather than two. The impacts associated with that one site could be significant depending on the location of the site and the existing transportation system serving it. Therefore, a “high risk/impact” rating (-3) is assigned in Table 6.1-4 under both the high and medium volume categories for levee maintenance and rehandling facilities. However, habitat restoration is rated as “0” because it is assumed that rehandling is not necessary. It should be noted that actual impacts may differ dramatically, depending on the number of sites and how they are operated. One larger facility could have very different effects compared to several smaller facilities that, overall, handled the same volume of material. Project-specific evaluations would be required to determine whether impacts would be significant, and to identify any mitigation measures necessary to avoid or minimize them.

Since no new rehandling facility would be needed at low volumes of UWR placement or disposal, no additional traffic-related impacts would be expected, and a negligible risk/impact” rating (0) is indicated.

### 6.1.5 Air Quality Comparisons

The following is a presentation of air quality impacts that could occur from low, medium, and high volume disposal activities at generic placement environments within the San Francisco Bay Area. Air quality impacts from associated dredging activities are not discussed here, but are presented in combination with disposal activities related to the four project alternatives in section 6.2.4.

Information on disposal activities was obtained from EPA staff (personal communication, B. Tuden, J.Katz, and B. Ross 1995) and from environmental documentation of similar activities within the San Francisco Bay region, including the Oakland Harbor SEIR/S (USACE and Port of Oakland 1994), the Richmond Harbor Draft SEIS/EIR (USACE and Port of Richmond 1995), and the John F. Baldwin Navigation Channel Deepening Project ADEIR/S (USACE and Contra Costa County 1995). Emission inventories were estimated for each disposal scenario and based on existing and future operational assumptions. Factors that could affect the emissions calculated for each disposal scenario and measures that would reduce significant emissions are also discussed.

Emission factors used to calculate disposal equipment emissions were obtained from *Compilation of Air Pollution Emission Factors, AP-42, Vols. I and II* (USEPA 1985 and 1993c), EMFAC7F (ARB 1993b), and special studies on vessel emissions conducted for the ARB (1984). Documentation of equipment usage and emission calculations associated with each disposal scenario can be found in Appendix O.

It is assumed that all sediments would be uncontaminated and suitable for disposal. Therefore, the impact of toxic pollutants that could be released to the atmosphere from dry dredging sediments (fugitive dust) was not analyzed in this EIS/EIR.

### 6.1.5.1 Impact Significance Criteria

Criteria to determine the significance of air quality impacts are based on federal, state, and local air pollution standards and regulations. Impacts would be considered significant if proposed emissions

1. Increase ambient pollutant levels from below to above the NAAQS or CAAQS;

2. Substantially contribute to an existing or projected air quality standard violation,

3. Are inconsistent with emission growth factors contained in the

    (a) Clean Air Plan (CAP),

    (b) O3 Maintenance Plan, or

    (c) CO Maintenance Plan (inconsistent projects include those exceeding the land use and population forecasts used to generate future emissions in these plans),

4. Exceed the de minimis thresholds that trigger a conformity determination subsequent to Section 176(c) of the CAA (100 tons per year of VOC or NOx), or

5. Exceed the following thresholds that the BAAQMD uses for CEQA purposes to determine the significance of operational activities: 80 pounds per day or 15 tons per year of reactive organic gases (ROG), NOx, or PM10 (BAAQMD 1995).

Since the overwhelming majority of the LTMS program would occur within the BAAQMD, the thresholds listed in criterion 5 above have been chosen to determine project significance.

The BAAQMD no longer uses emission thresholds to evaluate the significance of construction emissions. To analyze the relative level of proposed emissions, the operational thresholds in item 5 above are used at this time. However, the BAAQMD requires the implementation of feasible PM10 control measures to ensure that fugitive dust emissions remain insignificant from construction activities. These control measures include the following, depending on the size of the project area.

**Basic Control Measures.** The following controls should be implemented at all construction sites.

- Water all active construction areas at least twice daily.

- Cover all trucks hauling soil, sand, and other loose material *or* require all trucks to maintain at least 2 feet of freeboard (the space between top of load and top edge of truck bed).

- Pave, apply water three times daily, or apply (non-toxic) soil stabilizers on all unpaved access roads, parking areas and staging areas at construction sites.

- Sweep daily (with water sweepers) all paved access roads, parking areas and staging areas at construction sites.

- Sweep streets daily (with water sweepers) if visible soil material is carried onto adjacent public streets.

**Enhanced Control Measures.** The following measures should be implemented at construction sites greater than 4 acres in area.

- All “Basic” control measures listed above.

- Hydroseed or apply (non-toxic) soil stabilizers to inactive construction areas (previously graded areas inactive for 10 days or more).

- Enclose, cover, water twice daily or apply (non-toxic) soil binders to exposed stockpiles (dirt, sand, etc.).

- Limit traffic speeds on unpaved roads to 15 mph.

- Install sandbags or other erosion control measures to prevent silt runoff to public roadways.

- Replant vegetation in disturbed areas as quickly as possible.

**Optional Control Measures.** The following control measures are strongly encouraged at construction sites that are large in area, located near sensitive receptors, or which for any other reason may warrant additional emissions reductions.

- Install wheel washers for all exiting trucks, or wash off the tires or tracks of all trucks and equipment leaving the site.
- Install wind breaks, or plant trees/vegetative wind breaks at windward side(s) of construction areas.
- Suspend excavation and grading activity when winds (instantaneous gusts) exceed 25 mph.
- Limit the area subject to excavation, grading and other construction activity at any one time.

### 6.1.5.2 Ocean Disposal

The main sources of emissions that would occur from ocean disposal of dredged sediments include diesel-powered tugboats, barge equipment, and support vessels. Assumptions used in the analysis include the following: (1) 2,300 horsepower tugboats would transport dredged sediments in 5,000 cy bottom-dumping barges, with an equivalent dry sediment load of 4,000 cy; (2) the transport distance from the dredging to ocean disposal site would be 71 nautical miles, which is the average of the high and low values assumed in the EPA project cost analysis (EPA 1995); (3) average tugboat speed would be 6 knots; (4) all equipment would operate 22 hours per day; and (5) all three disposal volume scenarios would be completed within 1 year.

Summaries of daily and total emissions that would occur from low, medium, and high ocean disposal scenarios are provided in tables 6.1-5 and 6.1-6, respectively. As shown in Table 6.1-5, daily emissions for each disposal scenario would exceed the BAAQMD emission thresholds for ROG, NOx, and PM10. These emissions would therefore be significant.

**Table 6.1-5. Daily Emissions for Low/Medium/High Volume Disposal Scenarios at Proposed Placement Environments**

| ***Placement Environment/ Disposal Volume*** | **DAILY EMISSIONS (POUNDS)** | | | | | | |
|---|---|---|---|---|---|---|---|
| | ***TOG*** | ***ROG*** | ***CO*** | ***$NO_x$*** | ***$SO_2$*** | ***PM*** | ***$PM_{10}$*** |
| **Ocean** | | | | | | | |
| Low/Medium/High | 302 | 290 | 470 | 2,704 | 189 | 218 | 209 |
| **In-Bay** | | | | | | | |
| Low | 26 | 25 | 19 | 160 | 12 | 5 | 3 |
| Medium/High | 121 | 117 | 171 | 1,021 | 72 | 74 | 69 |
| **Habitat Restoration** | | | | | | | |
| Low/Medium/High | 147 | 141 | 327 | 1,640 | 113 | 86 | 76 |
| **Levee Restoration** | | | | | | | |
| Low/Medium/High | 229 | 220 | 741 | 3,324 | 230 | 174 | 155 |
| **Rehandling Facility** | | | | | | | |
| Low | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Medium/High | 288 | 277 | 700 | 2,823 | 196 | 191 | 175 |
| **BAAQMD Emission Thresholds** | | **80** | | **80** | | | **80** |

Feasible measures to reduce significant emissions would include (1) retard injection timing of diesel-powered equipment for NOx control, and (2) use of reformulated diesel fuel to reduce ROG and SO2 (a precursor to PM10) . Retarding injection timing by two degrees would reduce $NO_x$ emissions by about 15 percent from diesel-powered equipment. Although retarding injection timing by more than 2 degrees would further reduce $NO_x$ emissions, it would adversely affect fuel consumption. Use of reformulated fuel (ARB diesel fuel) would reduce ROG and $SO_2$ emissions by 15 and 64 percent, respectively, from diesel-powered equipment (Southwest Research Institute 1991).

**Table 6.1-6. Total Emissions and Emission Factors per Unit Volume for Low/Medium/High Volume Disposal Scenarios at Proposed Placement Environments**

| *Placement Environment/ Disposal Volume* | TOTAL EMISSIONS (TONS) | | | | | | |
|---|---|---|---|---|---|---|---|
| | *TOG* | *ROG* | *CO* | *$NO_x$* | *$SO_2$* | *PM* | *$PM_{10}$* |
| **Ocean** | | | | | | | |
| Low | 13.57 | 13.03 | 21.16 | 121.64 | 8.49 | 9.80 | 9.41 |
| Medium | 32.57 | 31.27 | 50.78 | 291.93 | 20.37 | 23.52 | 22.58 |
| High | 51.57 | 49.51 | 80.41 | 462.21 | 32.25 | 37.24 | 35.75 |
| **In-Bay** | | | | | | | |
| Low | 2.15 | 2.06 | 1.59 | 13.22 | 0.98 | 0.38 | 0.25 |
| Medium | 5.63 | 5.41 | 7.11 | 44.62 | 3.17 | 2.90 | 2.66 |
| High | 9.11 | 8.75 | 12.63 | 76.03 | 5.35 | 5.41 | 5.08 |
| **Habitat Restoration** | | | | | | | |
| Low | 3.17 | 3.04 | 7.04 | 35.33 | 2.43 | 1.85 | 1.64 |
| Medium | 8.39 | 8.06 | 18.65 | 93.59 | 6.45 | 4.91 | 4.34 |
| High | 13.95 | 13.39 | 31.01 | 155.57 | 10.71 | 8.17 | 7.21 |
| **Levee Restoration** | | | | | | | |
| Low | 4.77 | 4.58 | 15.45 | 69.31 | 4.79 | 3.63 | 3.22 |
| Medium/High | 5.77 | 5.54 | 18.69 | 83.81 | 5.79 | 4.40 | 3.90 |
| **Rehandling Facility** | | | | | | | |
| Low | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Medium | 6.53 | 6.27 | 18.48 | 53.20 | 3.61 | 4.80 | 4.51 |
| High | 13.14 | 12.87 | 37.93 | 109.20 | 7.40 | 9.84 | 9.25 |
| *Placement Environment/ Disposal Volume* | TONS OF EMISSIONS PER 100,000 cy MATERIAL | | | | | | |
| | *TOG* | *ROG* | *CO* | *$NO_x$* | *$SO_2$* | *PM* | *$PM_{10}$* |
| **Ocean** | | | | | | | |
| Low/Medium/High | 1.36 | 1.30 | 2.12 | 12.16 | 0.85 | 0.98 | 0.94 |
| **In-Bay** | | | | | | | |
| Low | 0.21 | 0.21 | 0.16 | 1.32 | 0.10 | 0.04 | 0.03 |
| Medium | 0.24 | 0.23 | 0.30 | 1.86 | 0.13 | 0.12 | 0.11 |
| High | 0.24 | 0.23 | 0.33 | 2.00 | 0.14 | 0.14 | 0.13 |
| **Habitat Restoration** | | | | | | | |
| Low/Medium/High | 0.56 | 0.53 | 1.24 | 6.20 | 0.43 | 0.33 | 0.29 |
| **Levee Restoration** | | | | | | | |
| Low/Medium/High | 1.11 | 1.07 | 3.59 | 16.12 | 1.11 | 0.85 | 0.75 |
| **Rehandling Facility** | | | | | | | |
| Low | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Medium/High | 1.72 | 1.65 | 4.86 | 14.00 | 0.95 | 1.26 | 1.19 |

Emissions from ocean disposal are highly dependent on transport distance and barge capacity. An increase or decrease in transport distance would produce a corresponding change in emissions. The larger the barge, the fewer the number of trips required to dispose of a given volume of dredged sediments. Fewer barge trips would correspondingly minimize the emissions from tugboats, the main contributors to ocean disposal emissions.

Table 6.1-6 also presents emissions that would occur from the disposal of 100,000 cy of sediment at an ocean site. In comparison to disposal at the other placement environments, ocean disposal would rank in the median for emissions produced per disposal unit volume. This is due to the long transport distance to the disposal site, resulting in an extensive amount of tug boat emissions.

Disposal emissions would be spread over a large portion of the Bay Area, between the dredging site and offshore waters. Additionally, since disposal emission sources would be mobile, pollutant impacts in a localized area would not be large enough to exceed any ambient air quality standard.

Emissions from ocean disposal would generally occur on the waters of the San Francisco Bay and offshore regions. Since there are no sensitive receptors in this region, ocean disposal would not impact this portion of the population. Ocean disposal would be the least threatening to sensitive receptors of all the proposed placement environments. Definitive impacts to sensitive receptors would be considered at the project-specific EIS/EIR level and not in this programmatic EIS/EIR.

#### 6.1.5.3 In-Bay Disposal

The main sources of emissions that would occur from in-Bay disposal of dredged sediments include diesel-powered tugboats, barge equipment, a hopper dredge, and support vessels. Assumptions used in the analysis that differ from those used for ocean disposal include the following: (1) a hopper dredge, with a capacity of 4,000 cy (dry sediment basis), would transport 1 mcy of sediment to the disposal site. The remaining sediments for the medium and high analyses would be transported by 1,050 horsepower tugboats that tow 2,500 cy bottom-dumping barges, with an equivalent dry sediment load of 2,000 cy, and (2) the transport distance from the dredging to in-Bay disposal site would be 13.5 nautical miles, which is the average of the high and low values assumed in the EPA project cost analysis (USEPA 1995).

Summaries of daily and total emissions that would occur from low, medium, and high in-Bay disposal scenarios are provided in Tables 6.1-5 and 6.1-6, respectively. As shown in Table 6.1-5, daily emissions from the low volume scenario would exceed the BAAQMD emission threshold for $NO_x$. The medium/high volume scenarios would exceed both the NOx and ROG BAAQMD emission thresholds. Consequently, these emissions would be significant.

Feasible measures to reduce $NO_x$ and ROG emissions from the proposed action would be the same as those mentioned in section 6.1.5.2: (1) the use of injection timing retard would reduce $NO_x$ emissions by about 15 percent from diesel-powered equipment and (2) the use of reformulated diesel fuel would reduce ROG emissions by 15 percent.

Emissions from in-Bay disposal are highly dependent on sediment transport distance and barge capacity. An increase or decrease in transport distance would produce a corresponding change in emissions. The larger the barge, the fewer the number of trips required to dispose of a given volume of sediments. Fewer barge trips would minimize emissions from tugboats, the main contributors to in-Bay disposal emissions. Table 6.1-6 also presents emissions that would occur from the disposal of 100,000 cy of sediment at an in-Bay location. In comparison to disposal at other placement environments, in-Bay disposal would produce the least amount of emissions per disposal unit volume. This is due to the short transport distance to the disposal site and the quick unloading technique of bottom-dumping barges.

Emissions from in-Bay disposal would generally occur on the waters of the San Francisco Bay. Consequently, these emissions would occur at a considerable distance from any sensitive receptor and would not be expected to adversely impact this portion of the population. Definitive impacts to sensitive receptors would be considered at the project-specific EIS/EIR level and not in this programmatic EIS/EIR.

Disposal emissions would be spread over a large portion of the Bay Area, between the dredging site and in-Bay disposal location. Additionally, since disposal emission sources would be mobile, pollutant impacts in a localized area would not be large enough to exceed any ambient air quality standard.

#### 6.1.5.4 Upland/Wetland Disposal

*Habitat Restoration*

The main sources of emissions that would occur from disposal of dredged sediments at habitat restoration locations include diesel-powered tugboats used for sediment transport, barge equipment, support vessels, hydraulic pumps to off-load dredged sediments, and booster pumps to transport sediments by pipeline to disposal sites. Assumptions used in the analysis that differ from those used for in-Bay disposal include the following: (1) the transport distance from dredging to habitat restoration disposal sites would be 15 nautical miles, which is the average distance from the dredging centroid of the Bay to potential habitat restoration sites (LTMS 1994e); (2) one 1,500-horsepower hydraulic pump would be used to unload sediments at a rate of 1,210 cy per hour; and (3) two 1,500-horsepower booster pumps would assist in transporting sediments 15,000 feet by pipeline to the disposal site. Although not assumed in the analysis, disposal activities could include use of earth-moving equipment, such as bulldozers, scrapers, or graders for site preparation and/or sediment handling. However, these sources would contribute a small percentage of the total emissions associated with disposal at habitat restoration sites (USACE and Port of Oakland

1994; USACE and Port of Richmond 1995; and USACE and Contra Costa County 1995).

Summaries of daily and total emissions that would occur from low, medium, and high habitat restoration disposal scenarios are provided in Tables 6.1-5 and 6.1-6, respectively. As shown in Table 6.1-5, daily emissions for each disposal scenario would exceed the BAAQMD emissions thresholds for ROG and NOx. These emissions would therefore be significant.

Feasible measures to reduce $NO_x$ and ROG emissions from the proposed action would be the same as those mentioned in section 6.1.5.2: (1) the use of injection timing retard would reduce $NO_x$ emissions by about 15 percent from diesel-powered equipment and (2) the use of reformulated diesel fuel would reduce ROG emissions by 15 percent.

Emissions from habitat restoration disposal are highly dependent on sediment transport distance, barge capacity, and sediment pumping distance from an unloading facility. An increase or decrease in transport distance would produce a corresponding change in tugboat emissions. The larger the barge, the fewer the number of trips required to dispose of a given volume of dredged sediments. Fewer barge trips would minimize emissions from tugboats, the main contributors to habitat restoration disposal emissions. The distance from the unloading facility to the disposal site would determine if pipeline booster pumps would be required for sediment disposal. The analysis assumes that a booster pump would be required for every 5,000 feet of pipeline beyond the unloading facility. Since these pumps are usually diesel-powered and average about 1,500 horsepower, they are substantial emission sources. Limiting the distance required to pump sediments would minimize emissions from these sources. If feasible, electrification of these large stationary pumps would be a substantial mitigation measure.

Table 6.1-6 also presents emissions that would occur from the disposal of 100,000 cy of sediment at a habitat restoration site. In comparison to disposal at the other placement environments, habitat restoration disposal would produce the second lowest amount of emissions per disposal unit volume. This is largely due to a relatively short transport distance to the disposal site, which minimizes tug boat emissions.

Emissions of $PM_{10}$ in the form of wind-blown dust could occur if site preparation requires earth-moving of dry soils. However, implementation of the BAAQMD PM10 control measures would ensure that fugitive dust emissions remain insignificant. Handling and disposal of sediments would not produce any fugitive dust, due to a high water content. Most soils from levees that remain exposed to the atmosphere eventually would be covered with vegetation and would produce a minimal amount of fugitive dust.

Odor impacts could be an issue from habitat restoration if dredged sediments contain sulfide compounds or decomposing organic matter that are exposed to the atmosphere. However, it is not expected that disposal activities would generate significant odor impacts, especially since most of the sediments would be placed directly underwater. Historically, handling of dredged sediments in the San Francisco Bay region has generated only minimal complaints from the public (USACE and Port of Oakland 1994; USACE and Port of Richmond 1995; and USACE and Contra Costa County 1995). This has been due to the relatively small amounts of sulfide and organic compounds found in the sediments and an adequate distance between where sediments were handled and the nearest population, which enabled odors to sufficiently disperse. Generally, the greatest potential for odor impacts would occur during sediment drying activities, where sediments are turned for maximum exposure to the atmosphere. However, this activity would not occur during habitat restoration.

Emissions from habitat restoration disposal would occur on the waters of the San Francisco Bay and within the restoration site, generally a considerable distance from sensitive receptors. The proximity of sensitive receptors to the restoration site must be considered to ensure that impacts to this portion of the population remain insignificant. Factors to consider include wind patterns, the distance between emissions sources and sensitive receptors, and the potential for fugitive dust and odors. Definitive impacts to sensitive receptors would be considered at the project-specific EIS/EIR level and not in this programmatic EIS/EIR.

Disposal emissions would be spread over a large portion of the Bay Area, between the dredging site and disposal location. Additionally, since the majority of disposal emission sources would be mobile, pollutant impacts in a localized area would not be large enough to exceed any ambient air quality standard.

### *Levee Restoration*

The main sources of emissions that would occur from disposal of dredged sediments for levee restoration include diesel-powered tugboats used for sediment transport, barge equipment, support vessels, a clamshell crane used to unload dredged sediments, and earth-moving equipment used for final placement of sediments onto levees. Assumptions used in the analysis that differ from those used for habitat restoration disposal include the following: (1) the transport distance from dredging to levee sites would be 40.3 nautical miles, which is the average distance from the dredging centroid of the Bay to potential levee restoration sites; (2) one 5,000-horsepower clamshell crane would be used to unload sediments at a rate of 550 cy per hour; and (3) two bulldozers, one scraper, and one grader would handle sediments on the levees. Although not assumed in the analysis, transport of sediments to levees could occur by truck. This form of transportation would generate a similar amount of emissions per unit volume of sediment as barge transport.

Summaries of daily and total emissions that would occur from low, medium, and high levee restoration disposal scenarios are provided in Tables 6.1-5 and 6.1-6, respectively. As shown in Table 6.1-5, daily emissions for each disposal scenario would exceed the BAAQMD emissions thresholds for ROG, NOx, and PM10. These emissions would therefore be significant.

Feasible measures to reduce ROG, $NO_x$ and SO2 emissions from the proposed action would be the same as those mentioned in section 6.1.5.2: (1) the use of injection timing retard would reduce $NO_x$ emissions by about 15 percent from diesel-powered equipment and (2) the use of reformulated diesel fuel would reduce ROG and $SO_2$ emissions by 15 and 64 percent, respectively, from diesel-powered equipment.

Emissions from levee restoration are highly dependent on sediment transport distance, barge capacity, and the clamshell crane used to unload sediments. An increase or decrease in transport distance would produce a corresponding change in tugboat emissions. The larger the barge, the fewer the number of trips required to dispose of a given volume of dredged sediments. Fewer barge trips would minimize emissions from tugboats. Use of a larger clamshell crane to unload sediments would somewhat improve the efficiency of the transfer process from barge to levee, compared to a smaller crane. This would result in fewer emissions. However, this piece of equipment would remain the largest contributor to emissions during disposal activities. If feasible, electrification of the clamshell crane would substantially mitigate emissions during levee restoration.

Table 6.1-6 also presents emissions that would occur from the disposal of 100,000 cy of sediment for levee restoration. In comparison to disposal at the other placement environments, disposal for levee restoration would produce the second highest amount of emissions per disposal unit volume. This is due to a relatively long transport distance to the disposal site and a slower unloading rate for the clamshell crane, compared to hydraulic off-loading at a habitat restoration location.

Emissions of $PM_{10}$ in the form of wind-blown dust could occur during site preparation and levee construction. However, implementation of the BAAQMD PM10 control measures would ensure that fugitive dust emissions remain insignificant. Handling and disposal of sediments would not produce any fugitive dust, due to a high water content. Most sediments from levees that remain exposed to the atmosphere eventually would be covered with vegetation and would produce a minimal amount of fugitive dust.

Odor impacts could be an issue from levee restoration disposal if dredged sediments contain sulfide compounds or decomposing organic matter that are exposed to the atmosphere. However, it is not expected that disposal activities would generate significant odor impacts, based on the history of dredging and disposal activities in the San Francisco Bay region. This has been due to the relatively small amounts of sulfide and organic compounds found in the sediments and an adequate distance between where sediments were handled and the nearest population, which enabled odors to sufficiently disperse. Generally, the greatest potential for odor impacts would occur during sediment drying activities, where sediments are turned for maximum exposure to the atmosphere. However, this activity would not occur during levee restoration.

Emissions from levee restoration disposal would occur on the waters of the San Francisco Bay and within the restoration site, generally a considerable distance from sensitive receptors. The proximity of sensitive receptors to the restoration site must be considered to ensure that impacts to this portion of the population remain insignificant. Factors to consider include the potential for fugitive dust, odors, wind patterns, and the distance between emissions sources and sensitive receptors. Definitive impacts to sensitive receptors would be considered at the project-specific EIS/EIR level and not in this programmatic EIS/EIR.

Levee restoration disposal emissions would be spread over a large portion of the Bay Area, between the dredging site and disposal location. Emissions would be the most concentrated near the clamshell crane, since this source would generate the largest amount of emissions for this disposal activity and it would be quasi-stationary. Site-specific analyses would be required to determine if emissions in proximity to the clamshell crane would potentially exceed any ambient air quality standard. Since the remaining disposal emission sources would be mobile, pollutant impacts in a localized area from these sources would not be large enough to exceed any ambient air quality standard and would therefore be insignificant.

*Rehandling Facility*

The main sources of emissions that would occur from disposal of dredged sediments at rehandling facilities include diesel-powered tugboats used for sediment transport, barge equipment, support vessels, hydraulic pumps to unload dredged sediments, booster pumps to transport sediments by pipeline to disposal sites, use of earth-moving equipment for site preparation and sediment handling, and use of trucks to transport sediments from rehandling facilities to landfills. Assumptions used in the analysis that differ from those used for habitat restoration disposal include the following: (1) the transport distance from dredging to rehandling facility disposal sites would be 19 nautical miles, which is the average distance from the dredging centroid of the Bay to potential rehandling sites; (2) two bulldozers and one scraper would handle sediments at the rehandling facility; (3) two front-end loaders would load dry sediments into 10-cy capacity haul trucks; (4) two bulldozers, one scraper, and one grader would handle sediments at the landfill; (5) the one-way distance from the rehandling facility to the landfill would be 12 miles; and (6) the volume of sediments transported to landfill sites was reduced 20 percent from the amount placed in a rehandling facility to take into account shrinkage due to drying. Although not assumed in the analysis, earth-moving equipment would be used for site preparation and construction of containment levees and interior dikes.

Summaries of daily and total emissions that would occur from low, medium, and high disposal scenarios at a rehandling facility are provided in Tables 6.1-5 and 6.1-6, respectively. As shown in Table 6.1-5, daily emissions for each disposal scenario would exceed the BAAQMD emissions thresholds for ROG, NOx, and PM10. These emissions would therefore be significant.

Feasible measures to reduce ROG, $NO_x$ and SO2 emissions from the proposed action would be the same as those mentioned in section 6.1.5.2: (1) the use of injection timing retard would reduce $NO_x$ emissions by about 15 percent from diesel-powered equipment and (2) the use of reformulated diesel fuel would reduce ROG and $SO_2$ emissions by 15 and 64 percent, respectively, from diesel-powered equipment.

Emissions from rehandling facility disposal activities are highly dependent on sediment transport distance, barge capacity, sediment pumping distance from the unloading site, and the transport distance from the facility to a landfill. An increase or decrease in transport distance would produce a corresponding change in tugboat emissions. The larger the barge, the fewer the number of trips required to dispose of a given volume of dredged sediments. Fewer barge trips would minimize emissions from tugboats, the main contributors to rehandling facility disposal emissions. The distance from the unloading site to the rehandling facility would determine if pipeline booster pumps would be required for sediment disposal. Since these pumps are usually diesel-powered and average about 1,500 horsepower, they are substantial emission sources. Limiting the distance required to pump sediments would minimize emissions from these sources. If feasible, electrification of large stationary pumps would be a substantial mitigation measure.

Table 6.1-6 also presents emissions that would occur from the disposal of 100,000 cy of sediment at a rehandling facility. In comparison to disposal at the other placement environments, disposal at this location would produce the highest amount of emissions per disposal unit volume. This is mainly due to the extensive equipment usage required to handle the sediments at the rehandling facility, then transport the material to the landfill for its final placement. In cases where dredged sediment is used as a replacement source for cover at an existing landfill, emissions from loading trucks, transport to the landfill, and final placement on the landfill should be netted out of the final emissions total for this placement environment. Otherwise, since these emissions would already be occurring at these facilities, they would be erroneously double counted in the analysis. Assuming this is the case, emissions per unit volume from disposal at a rehandling facility would be only slightly higher than emissions from habitat restoration.

Emissions of $PM_{10}$ in the form of wind-blown dust would occur during earth-moving activities related to site preparation and sediment handling. Disposal of sediments would not produce any fugitive dust, due to a high water content. Once sediments begin to dry, operation of earth-moving equipment on these sediments could generate minor amounts of fugitive dust. Additionally, loading sediments into trucks would be a minor source of dust emissions, since sediments would have a relatively moderate water content. If sediments are dry enough to emit dust emissions, trucks could be covered and/or loads sprayed with water so that dust would not be generated during transport of the sediments to landfill sites. Implementation of BAAQMD PM10 control measures would ensure that fugitive dust emissions remain insignificant.

Odor impacts could be an issue at rehandling landfill facilities if dredged sediments contain sulfide compounds or decomposing organic matter that are exposed to the atmosphere. However, it is not expected that disposal activities would generate significant odor impacts, based on the history of dredging and disposal activities in the San Francisco Bay region. This has been due to the relatively small amounts of sulfide and organic compounds found in the sediments and an adequate distance between where sediments were handled and the nearest population, which enabled odors to sufficiently disperse. Generally, the greatest potential for odor impacts would occur during the sediment drying activities, where sediments are turned for maximum exposure to the atmosphere. If an issue, this impact could be mitigated at rehandling facilities by decreasing the number of times that earth-moving equipment turn sediments.

Emissions from rehandling facility disposal activities would occur on the waters of the San Francisco Bay, within the rehandling site, along the truck route from the facility to the landfill, and within the landfill. Except for the haul truck routes, these locations are generally a considerable distance from sensitive receptors. The proximity of sensitive receptors to the rehandling and landfill sites must be considered to ensure that impacts to this portion of the population remain insignificant. Factors to consider include the potential for fugitive dust, odors, wind patterns, and the distance between emissions sources and sensitive receptors. Definitive impacts to sensitive receptors would be considered at the project-specific EIS/EIR level and not in this programmatic EIS/EIR.

Disposal emissions would be spread over a large portion of the Bay Area, between the dredging site, the rehandling facility, and the landfill location. Additionally, since the majority of disposal emission sources would be mobile, pollutant impacts in a localized area would not be large enough to exceed any ambient air quality standard.

### 6.1.6 Archaeological and Cultural Resource Comparisons

There are no known archaeological or cultural resources at the existing ocean or in-Bay disposal sites. Therefore, no impacts or benefits are expected at any placement volume at any of these aquatic sites. However, there is the potential to affect archaeological or cultural resources that may exist at upland or wetland reuse sites. The risk of encountering such resources increases with increasing overall volumes of upland or wetland placement. However, whether such encounters would result in significant impacts or benefits cannot be predicted at this programmatic level of analysis. All upland or wetland reuse projects would need to conduct the appropriate level of coordination with the State Historic Preservation Office, and conduct surveys as necessary, prior to construction of any new facilities. If significant resources are present, options for avoiding or mitigating any impacts would have to be explored on a site-specific basis.

### 6.1.7 Summary of Benefits and Impacts by Placement Environment

Table 6.1-7 is a summary of the potential benefits and impacts/risks associated with relative volumes of dredged material placed in each environment. It summarizes the discussions and associated tables in sections 6.1.1 through 6.1.6. It is intended to allow the reader to see the ratings of the benefits and impacts/risks for the placement environments together for comparative purposes.

The table shows that in-Bay and ocean disposal of dredged material has no benefits and has some impacts/risks, particularly with disposal of high volumes. Placement in the UWR environment has significant benefits but also has risks. The impacts/risks are greatest with high placement volumes and decrease with medium placement volumes because sensitive areas can more easily be avoided due to fewer projects. Please refer to the previous sections for detailed discussion of the ratings.

### 6.1.8 Final Alternatives Carried Forward for Consideration

Based upon the results of the “generic analysis” presented above, the LTMS agencies have eliminated from further consideration any alternative that includes a “high” overall placement volume in any one environment. These include Preliminary Alternative C (Emphasize Ocean Disposal) and Preliminary Alternative F (Emphasize Upland/Wetland Reuse). In the case of the upland/wetland/reuse placement environment in particular, there is the potential for substantial adverse environmental impacts from high placement volumes. Continued high disposal volumes at in-Bay sites would also represent a degree of risk to

Table 6.1-7. Summary of Potential Benefits and Impacts by Placement Environment and Disposal Volume

## Table 6.1-7. Summary of Potential Benefits and Impacts by Placement Environment and Disposal Volume

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| **Placement Environment** | ***BENEFITS **** | | | ***IMPACTS/RISKS **** | | |
|---|---|---|---|---|---|---|
| | ***High Volume*** | ***Medium Volume*** | ***Low Volume*** | ***High Volume*** | ***Medium Volume*** | ***Low Volume*** |
| **Water Quality** | | | | | | |
| Ocean | 0 | 0 | 0 | -1 | 0 | 0 |
| In-Bay | 0 | 0 | 0 | -2 | -1 | 0 |
| Upland/Wetland Reuse | | | | | | |
| *Habitat Restoration* | +2 | +2 | +1 | -1 | 0 | 0 |
| *Levee Maintenance* | 0 | 0 | 0 | -1 | -1 | -1 |
| *Rehandling Facility* | 0 | 0 | 0 | -1 | 0 | 0 |
| **Fish and Wildlife Habitat** | | | | | | |
| Ocean | 0 | 0 | 0 | -1 | 0 | 0 |
| In-Bay | 0 | 0 | 0 | -2 | -1 | 0 |
| Upland/Wetland Reuse | | | | | | |
| *Habitat Restoration* | +3 | +2 | +1 | -3 | -1 | 0 |
| *Levee Maintenance* | 0 | 0 | 0 | 0 | 0 | 0 |
| *Rehandling Facility* | 0 | 0 | 0 | -1 | 0 | 0 |
| **Special Status Species** | | | | | | |
| Ocean | 0 | 0 | 0 | -1 | 0 | 0 |
| In-Bay | 0 | 0 | 0 | 0 | 0 | 0 |
| Upland/Wetland Reuse | | | | | | |
| *Habitat Restoration* | +3 | +2 | +1 | -1 | 0 | 0 |
| *Levee Maintenance* | 0 | 0 | 0 | 0 | 0 | 0 |
| *Rehandling Facility* | 0 | 0 | 0 | 0 | 0 | 0 |

* Potential Benefits: +3 = High Benefit; +2 = Moderate Benefit; +1 = Low Benefit; 0 = Negligible Benefit.
Potential Impacts or Risks: - 3 = High Impact; - 2 = Moderate Impact; - 1 = Low Impact; 0 = Negligible Impact.

**Table 6.1-7. Summary of Potential Benefits and Impacts by Placement Environment and Disposal Volume**
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| | ***Benefits **** | | | ***Impacts/Risks **** | | |
|---|---|---|---|---|---|---|
| ***Placement Environment*** | ***High Volume*** | ***Medium Volume*** | ***Low Volume*** | ***High Volume*** | ***Medium Volume*** | ***Low Volume*** |
| **Transportation Systems** | | | | | | |
| Ocean | 0 | 0 | 0 | 0 | 0 | 0 |
| In-Bay | 0 | 0 | 0 | 0 | 0 | 0 |
| Upland/Wetland Reuse | | | | | | |
| *Habitat Restoration* | 0 | 0 | 0 | -3 | -3 | 0 |
| *Levee Maintenance* | 0 | 0 | 0 | -3 | -3 | 0 |
| *Rehandling Facility* | 0 | 0 | 0 | -3 | -3 | 0 |
| **Air Quality** | | | | | | |
| Ocean | 0 | 0 | 0 | -3 | -3 | -3 |
| In-Bay | 0 | 0 | 0 | -3 | -3 | -3 |
| Upland/Wetland Reuse | | | | | | |
| *Habitat Restoration* | 0 | 0 | 0 | -3 | -3 | -3 |
| *Levee Maintenance* | 0 | 0 | 0 | -3 | -3 | -3 |
| *Rehandling Facility* | 0 | 0 | 0 | -3 | -3 | -3 |

* Potential Benefits: +3 = High Benefit; +2 = Moderate Benefit; +1 = Low Benefit; 0 = Negligible Benefit.
Potential Impacts or Risks: - 3 = High Impact; - 2 = Moderate Impact; - 1 = Low Impact; 0 = Negligible Impact.

various resources dependent on the already-stressed Estuary system; however, a more significant concern is that the LTMS goal for environmental enhancement through beneficial reuse of dredged material could not be sufficiently realized at high in-Bay disposal volumes that treat the material as a waste instead of as a valuable resource. In the case of ocean disposal at high volumes, overall impacts and risks to the Estuary system would be reduced; but, as for in-Bay disposal at high volumes, very limited beneficial reuse of dredged material would mean that the LTMS goals could not be achieved.

An additional reason that high placement volumes in any one type of environment are eliminated from further consideration is that over-reliance on one form of disposal is unwise from both an economic and management standpoint. If a variety of sites is available, then unforeseen circumstances that may limit the available capacity in one disposal environment would be less likely to cause a serious disruption of dredging activity. Without a variety of sites available, many dredging projects could be delayed until new sites could be developed. This could result in significant navigational problems and, ultimately, in disruptions in the flow of commerce and impacts to the regional economy as a whole. In short, a variety of dredged material placement options is important insurance against a return to “mudlock” in the San Francisco Bay Area.

An exception to the complete elimination of high volumes in any placement environment is the No-Action alternative. No-Action, representing current conditions, includes high volumes of disposal at existing in-Bay sites. The No-Action alternative must be retained under both NEPA and CEQA for comparison with the final “action” alternatives.

Therefore, in addition to the No-Action alternative, the final “action” alternatives carried forward for consideration include the following:

*Alternative 1: Emphasize Aquatic Disposal (minimal upland/wetland reuse).* This alternative includes medium in-Bay disposal, medium ocean disposal, and low upland/wetland reuse. This is the same as Preliminary Alternative B described in Chapter 5.

*Alternative 2: Balance Upland/Wetland Reuse and In-Bay Disposal (minimal ocean disposal).* This alternative includes medium in-Bay disposal, low ocean disposal, and medium upland/wetland reuse. This is the same as Preliminary Alternative D described in Chapter 5.

*Alternative 3: Balance Upland/Wetland Reuse and Ocean Disposal (minimal in-Bay disposal).* This alternative includes low in-Bay disposal, medium ocean disposal, and medium upland/wetland reuse. This is the same as Preliminary Alternative E described in Chapter 5.

The differences among these alternatives are shown in Figure 6.1-1. The final “action” alternatives each provide for a diversity of dredged material placement sites, and they each would provide a degree of beneficial reuse. They differ in terms of the relative emphasis on each placement environment, and they address the full range of distributions that are possible using combinations of medium and low volumes among the three placement environments. Each of them has a reasonable expectation of being implementable in the San Francisco Bay Area (although they differ in the degree to which they can be implemented immediately). Each of the final “action” alternatives also include all of the common “companion policies” described in Chapter 5 that mitigate or obviate some of the adverse effects that could otherwise occur.

### 6.1.9 Summary Matrix: Benefits and Impacts/Risks of the Final Alternatives Compared to the Environmental Criteria in the Preceding Generic Analysis

The final alternatives are compared using the environmental evaluation criteria discussed in the generic analysis, in the summary below, and in Table 6.1-8. Please see sections 6.1.1 through 6.1.6 for a detailed discussion.

All of the action alternatives including the preferred alternative have no benefit for the ocean environment and negligible impacts on the ocean environment, with the exception of the impact on air quality. The impact on air quality from disposal in the ocean is considered high for all of the alternatives because they would all result in exceedances of BAAQMD emissions thresholds. However, since emission sources would be mobile, impacts in a localized area would not be large enough to exceed any ambient air quality standard.

All of the action alternatives, particularly the preferred alternative, would benefit the in-Bay environment by reducing the overall volume of dredged material being

Figure 6.1-1 Relative Sediment Volumes Destined for each Type of Placement Environment under the Various LTMS Alternatives

Table 6.1-8 Summary of Policy-Level Mitigation Measures Specific to Placement Environments and Resources, by Alternative

**Table 6.1-8. Summary of Policy-Level Mitigation Measures Specific to Placement Environments and Resources, by Alternative**

| *Placement Environment* | *Resource* | *Policy-Level Mitigation Measure (a)* | *Significance of Benefit* | *Significance of Impact/Risk After Mitigation* |
|---|---|---|---|---|
| **Alternative 1 (Emphasize Aquatic Disposal) — Medium Ocean, Medium In-Bay, Low UWR (b)** | | | | |
| Ocean | Water Quality | SMM1, SMM2; SQ1, SQ2, SQ3, SQ4 | 0 | 0 |
| | Fish & Wildlife Habitat | SMM1, SMM2; SQ1, SQ2, SQ3, SQ4 | 0 | 0 |
| | Special Status Species | SMM1, SMM2; SQ1, SQ2, SQ3, SQ4 | 0 | 0 |
| | Transportation Systems | See note (c) | 0 | 0 |
| | Air Quality | See note (c) | 0 | -3 |
| In-Bay | Water Quality | CAD1; SMM1, SMM2; SQ1, SQ2, SQ3, SQ4 | 0 | -1 |
| | Fish & Wildlife Habitat | CAD1; HP2; SMM1, SMM2; SQ1, SQ2, SQ3, SQ4 | 0 | -1 |
| | Special Status Species | CAD1; HP2; SMM1, SMM2; SQ1, SQ2, SQ3, SQ4 | 0 | 0 |
| | Transportation Systems | See note (c) | 0 | 0 |
| | Air Quality | See note (c) | 0 | -3 |
| *Upland/Wetland Reuse* | Water Quality | | | |
| Habitat Restoration | | SMM1, SMM2; SQ1, SQ2, SQ3, SQ4; WR1 | +1 | 0 |
| Levee Maintenance | | LR1; SMM1, SMM2; SQ1, SQ2, SQ3, SQ4 | 0 | -1 |
| Rehandling Facility | | RF1; SMM1, SMM2; SQ1, SQ2, SQ3, SQ4 | 0 | 0 |
| *Upland/Wetland Reuse* | Fish & Wildlife Habitat | | | |
| Habitat Restoration | | HC1, HC2; SMM1, SMM2; SQ1, SQ2, SQ3, SQ4; WR1 | +1 | 0 |
| Levee Maintenance | | LR1; SMM1, SMM2; SQ1, SQ2, SQ3, SQ4 | 0 | 0 |
| Rehandling Facility | | RF1; SMM1, SMM2; SQ1, SQ2, SQ3, SQ4 | 0 | 0 |
| *Upland/Wetland Reuse* | Special Status Species | | | |
| Habitat Restoration | | HC1, HC2; SMM1, SMM2; SQ1, SQ2, SQ3, SQ4; WR1 | +1 | 0 |

## Table 6.1-8. Summary of Policy-Level Mitigation Measures Specific to Placement Environments and Resources, by Alternative

| *Placement Environment* | *Resource* | *Policy-Level Mitigation Measure (a)* | *Significance of Benefit* | *Significance of Impact/Risk After Mitigation* |
|---|---|---|---|---|
| **Alternative 1 — Medium Ocean, Medium In-Bay, Low UWR (cont'd)** | | | | |
| Levee Maintenance | | LR1; SMM1, SMM2; SQ1, SQ2, SQ3, SQ4 | 0 | 0 |
| Rehandling Facility | | RF1; SMM1, SMM2; SQ1, SQ2, SQ3, SQ4 | 0 | 0 |
| *Upland/Wetland Reuse* | Transportation Systems | | | |
| Habitat Restoration | | SMM1, SMM2 | 0 | 0 |
| Levee Maintenance | | LR1; SMM1, SMM2; see note (c) | 0 | 0 |
| Rehandling Facility | | RF1; SMM1, SMM2; see note (c) | 0 | 0 |
| *Upland/Wetland Reuse* | Air Quality | See note (c) | 0 | -3 |
| **Alternative 2 (Balance In-Bay Disposal and UWR) — Low Ocean, Medium In-Bay, Medium UWR** | | | | |
| Ocean | Water Quality | SMM1, SMM2; SQ1, SQ2, SQ3, SQ4 | 0 | 0 |
| | Fish & Wildlife Habitat | SMM1, SMM2; SQ1, SQ2, SQ3, SQ4 | 0 | 0 |
| | Special Status Species | SMM1, SMM2; SQ1, SQ2, SQ3, SQ4 | 0 | 0 |
| | Transportation Systems | See note (c) | 0 | 0 |
| | Air Quality | See note (c) | 0 | -3 |
| In-Bay | Water Quality | CAD1; SMM1, SMM2; SQ1, SQ2, SQ3, SQ4 | 0 | -1 |
| | Fish & Wildlife Habitat | CAD1; HP2; SMM1, SMM2; SQ1, SQ2, SQ3, SQ4 | 0 | -1 |
| | Special Status Species | CAD1; HP2; SMM1, SMM2; SQ1, SQ2, SQ3, SQ4 | 0 | 0 |
| | Transportation Systems | See note (c) | 0 | 0 |
| | Air Quality | See note (c) | 0 | -3 |
| *Upland/Wetland Reuse* | Water Quality | | | |
| Habitat Restoration | | SMM1, SMM2; SQ1, SQ2, SQ3, SQ4; WR1 | +2 | 0 |
| Levee Maintenance | | LR1; SMM1, SMM2; SQ1, SQ2, SQ3, SQ4 | 0 | -1 |
| Rehandling Facility | | RF1; SMM1, SMM2; SQ1, SQ2, SQ3, SQ4 | 0 | 0 |

## Table 6.1-8. Summary of Policy-Level Mitigation Measures Specific to Placement Environments and Resources, by Alternative

| *Placement Environment* | *Resource* | *Policy-Level Mitigation Measure (a)* | *Significance of Benefit* | *Significance of Impact/Risk After Mitigation* |
|---|---|---|---|---|
| **Alternative 2 — Low Ocean, Medium In-Bay, Medium UWR (cont'd)** | | | | |
| *Upland/Wetland Reuse* | Fish & Wildlife Habitat | | | |
| Habitat Restoration | | HC1, HC2; SMM1, SMM2; SQ1, SQ2, SQ3, SQ4; WR1 | +2 | -1 |
| Levee Maintenance | | LR1; SMM1, SMM2; SQ1, SQ2, SQ3, SQ4 | 0 | 0 |
| Rehandling Facility | | RF1; SMM1, SMM2; SQ1, SQ2, SQ3, SQ4 | 0 | 0 |
| *Upland/Wetland Reuse* | Special Status Species | | | |
| Habitat Restoration | | HC1, HC2; SMM1, SMM2; SQ1, SQ2, SQ3, SQ4; WR1 | +2 | 0 |
| Levee Maintenance | | LR1; SMM1, SMM2; SQ1, SQ2, SQ3, SQ4 | 0 | 0 |
| Rehandling Facility | | RF1; SMM1, SMM2; SQ1, SQ2, SQ3, SQ4 | 0 | 0 |
| *Upland/Wetland Reuse* | Transportation Systems | | | |
| Habitat Restoration | | See note (c) | 0 | 0 |
| Levee Maintenance | | See note (c) | 0 | -3 |
| Rehandling Facility | | See note (c) | 0 | -3 |
| *Upland/Wetland Reuse* | Air Quality | See note (c) | 0 | -3 |
| **Alternative 3 (Balance Ocean Disposal and UWR) — Medium Ocean, Low In-Bay, Medium UWR** | | | | |
| Ocean | Water Quality | SMM1, SMM2; SQ1, SQ2, SQ3, SQ4 | 0 | 0 |
| | Fish & Wildlife Habitat | SMM1, SMM2; SQ1, SQ2, SQ3, SQ4 | 0 | 0 |
| | Special Status Species | SMM1, SMM2; SQ1, SQ2, SQ3, SQ4 | 0 | 0 |
| | Transportation Systems | See note (c) | 0 | 0 |
| | Air Quality | See note (c) | 0 | -3 |
| In-Bay | Water Quality | CAD1; SMM1, SMM2; SQ1, SQ2, SQ3, SQ4 | 0 | 0 |
| | Fish & Wildlife Habitat | CAD1; HP2; SMM1, SMM2; SQ1, SQ2, SQ3, SQ4 | 0 | 0 |
| | Special Status Species | CAD1; HP2; SMM1, SMM2; SQ1, SQ2, SQ3, SQ4 | 0 | 0 |

**Table 6.1-8. Summary of Policy-Level Mitigation Measures Specific to Placement Environments and Resources, by Alternative**

| *Placement Environment* | *Resource* | *Policy-Level Mitigation Measure (a)* | *Significance of Benefit* | *Significance of Impact/Risk After Mitigation* |
|---|---|---|---|---|
| **Alternative 3 — Medium Ocean, Low In-Bay, Medium UWR (cont'd)** | | | | |
| In-Bay | Transportation Systems | See note (c) | 0 | 0 |
| | Air Quality | See note (c) | 0 | -3 |
| *Upland/Wetland Reuse* | Water Quality | | | |
| Habitat Restoration | | SMM1, SMM2; SQ1, SQ2, SQ3, SQ4; WR1 | +2 | 0 |
| Levee Maintenance | | LR1; SMM1, SMM2; SQ1, SQ2, SQ3, SQ4 | 0 | -1 |
| Rehandling Facility | | RF1; SMM1, SMM2; SQ1, SQ2, SQ3, SQ4 | 0 | 0 |
| *Upland/Wetland Reuse* | Fish & Wildlife Habitat | | | |
| Habitat Restoration | | HC1, HC2; SMM1, SMM2; SQ1, SQ2, SQ3, SQ4; WR1 | +2 | -1 |
| Levee Maintenance | | LR1; SMM1, SMM2; SQ1, SQ2, SQ3, SQ4 | 0 | 0 |
| Rehandling Facility | | RF1; SMM1, SMM2; SQ1, SQ2, SQ3, SQ4 | 0 | 0 |
| *Upland/Wetland Reuse* | Special Status Species | | | |
| Habitat Restoration | | HC1, HC2; SMM1, SMM2; SQ1, SQ2, SQ3, SQ4; WR1 | +2 | 0 |
| Levee Maintenance | | LR1; SMM1, SMM2; SQ1, SQ2, SQ3, SQ4 | 0 | 0 |
| Rehandling Facility | | RF1; SMM1, SMM2; SQ1, SQ2, SQ3, SQ4 | 0 | 0 |
| *Upland/Wetland Reuse* | Transportation Systems | | | |
| Habitat Restoration | | See note (c) | 0 | 0 |
| Levee Maintenance | | See note (c) | 0 | -3 |
| Rehandling Facility | | See note (c) | 0 | -3 |
| *Upland/Wetland Reuse* | Air Quality | See note (c) | 0 | -3 |
| **No-Action (Current Conditions) — Low Ocean, Very High In-Bay, Low UWR** | | | | |
| Ocean | Water Quality | SMM1, SMM2; SQ1, SQ2, SQ3, SQ4 | 0 | 0 |
| | Fish & Wildlife Habitat | SMM1, SMM2; SQ1, SQ2, SQ3, SQ4 | 0 | 0 |
| | Special Status Species | SMM1, SMM2; SQ1, SQ2, SQ3, SQ4 | 0 | 0 |
| | Transportation Systems | See note (c) | 0 | 0 |

## Table 6.1-8. Summary of Policy-Level Mitigation Measures Specific to Placement Environments and Resources, by Alternative

| *Placement Environment* | *Resource* | *Policy-Level Mitigation Measure (a)* | *Significance of Benefit* | *Significance of Impact/Risk After Mitigation* |
|---|---|---|---|---|
| **No-Action — Low Ocean, Very High In-Bay, Low UWR (cont'd)** | | | | |
| | Air Quality | See note (c) | 0 | -3 |
| In-Bay | Water Quality | CAD1; SMM1, SMM2; SQ1, SQ2, SQ3, SQ4 | 0 | -2 |
| | Fish & Wildlife Habitat | CAD1; HP2; SMM1, SMM2; SQ1, SQ2, SQ3, SQ4 | 0 | -2 |
| | Special Status Species | CAD1; HP2; SMM1, SMM2; SQ1, SQ2, SQ3, SQ4 | 0 | -1 |
| | Transportation Systems | See note (c) | 0 | 0 |
| | Air Quality | See note (c) | 0 | -3 |
| *Upland/Wetland Reuse* | Water Quality | | | |
| Habitat Restoration | | SMM1, SMM2; SQ1, SQ2, SQ3, SQ4; WR1 | +1 | 0 |
| Levee Maintenance | | LR1; SMM1, SMM2; SQ1, SQ2, SQ3, SQ4 | 0 | -1 |
| Rehandling Facility | | RF1; SMM1, SMM2; SQ1, SQ2, SQ3, SQ4 | 0 | 0 |
| *Upland/Wetland Reuse* | Fish & Wildlife Habitat | | | |
| Habitat Restoration | | HC1, HC2; SMM1, SMM2; SQ1, SQ2, SQ3, SQ4; WR1 | +1 | 0 |
| Levee Maintenance | | LR1; SMM1, SMM2; SQ1, SQ2, SQ3, SQ4 | 0 | 0 |
| Rehandling Facility | | RF1; SMM1, SMM2; SQ1, SQ2, SQ3, SQ4 | 0 | 0 |
| *Upland/Wetland Reuse* | Special Status Species | | | |
| Habitat Restoration | | HC1, HC2; SMM1, SMM2; SQ1, SQ2, SQ3, SQ4; WR1 | +1 | 0 |
| Levee Maintenance | | LR1; SMM1, SMM2; SQ1, SQ2, SQ3, SQ4 | 0 | 0 |
| Rehandling Facility | | RF1; SMM1, SMM2; SQ1, SQ2, SQ3, SQ4 | 0 | 0 |
| *Upland/Wetland Reuse* | Transportation Systems | | | |
| Habitat Restoration | | See note (c) | 0 | 0 |
| Levee Maintenance | | See note (c) | 0 | 0 |
| Rehandling Facility | | See note (c) | 0 | 0 |
| *Upland/Wetland Reuse* | Air Quality | See note (c) | 0 | -3 |

***Notes*:**

a. Key to abbreviations for policy-level mitigation measures:

**CAD Confined Aquatic Disposal** (see Chapter 5)

CAD1. The LTMS agencies will address, as appropriate, the issues identified in Table 5.1-5 during site-specific assessments of proposed CAD sites for NUAD-class dredged material.

**CAP Establishment of Additional Capacity for Rehandling and for Upland/Wetland Reuse or Disposal** (see Chapter 6)

CAP1. The LTMS agencies will establish or support, to the full extent of their authorities, sufficient capacity at rehandling facilities and at upland/wetland reuse or disposal sites to appropriately manage NUAD-class dredged material and to meet the dredged material placement distribution for SUAD-class dredged material established in the Policy EIS/Programmatic EIR's preferred alternative.

**CDM Coordinated Dredged Material Management** (see Chapter 5)

CDM1. The COE, EPA, SFBRWQCB, and BCDC, together with the State Lands Commission, are formally cooperating in an interagency Dredged Material Management Office (DMMO), to coordinate regulatory requirements and to provide better service to the dredging community and the public. The DMMO was established as a pilot program by the Memorandum of Agreement (MOA), signed by the participating agencies. The DMMO will likely continue to review and coordinate on proposed dredging projects in accordance with the comprehensive LTMS Management Plan developed to implement the preferred alternative management approach selected in the LTMS Policy EIS/ Programmatic EIR.

**HC Upland Habitat Conversion Associated with Restoration Projects** (see Chapter 5)

HC1. The LTMS agencies will encourage, and authorize as legally appropriate, habitat enhancement and restoration efforts using dredged material that are designed to be consistent, to the maximum extent practicable, with specific habitat goals established by regional planning efforts for managing the region's natural resources. Implementation of projects in this manner will ensure that such reuse efforts will reflect the regional goals for restoration, thereby maximizing the environmental benefits of such projects for the region.

HC2. The LTMS agencies will also encourage, and authorize as legally appropriate, independent habitat restoration projects using dredged material (in areas not covered by established habitat goals) when they would clearly result in an overall net gain in habitat quality, and would minimize loss of existing habitat functions. Whenever feasible, such projects will provide, as part of the project design, for a no net loss in the habitat functions existing on the project site or, where necessary, provide compensatory mitigation for lost habitat functions in accordance with state and federal mitigation requirements.

**HP Habitat Protection** (see Chapter 5)

HP1. Dredging activities will be restricted as indicated on Table 5.1-1. Any dredging projects proposing deviations from these tables will not be approved by the LTMS agencies unless, through the Section 7 consultation process, project sponsors obtain project-specific concurrence from the appropriate resource agencies.

HP2. Dredged material disposal activities will be minimized or restricted as indicated on Table 5.1-2. The LTMS agencies will closely review disposal projects proposed for the designated in-Bay disposal sites to ensure that disposal during the indicated time frames is minimized or avoided as indicated. Disposal project proponents are advised that the agencies will require that the need for disposal at these sites during the specified time frames must be clearly established. Any disposal projects or new disposal sites proposing deviations from these tables will not be approved by the

LTMS agencies unless, through the Section 7 consultation process, project sponsors obtain project-specific concurrence from the appropriate resource agencies.

**LR Levee Reuse** (see Chapter 5)

LR1. The LTMS agencies will address, as appropriate, all of the issues identified in Table 5.1-6 in site-specific assessments of proposed levee maintenance, stabilization, or construction projects using dredged material.

LR2. To address water quality concerns associated with the reuse of dredged material for levee repair and stabilization in the Delta region, only material determined to be suitable in regard to pollutant and salinity concentrations, as well as material which has been processed to reduce pollutants and salinity to suitable concentrations, will be used for this purpose. This may involve such control measures as directing only material dredged from the eastern portion of San Francisco Bay, where sediment salinity concentrations are lowest, for reuse purposes in the Delta region.

**ND Reviewing the Need for Dredging** (see Chapter 5)

ND1. The COE, in consultation with the other LTMS agencies, will confirm or revise the Dredged Material Management plans for existing federal maintenance dredging projects in San Francisco Bay, and perform NEPA reviews as needed including supplementing the Composite EIS for Maintenance Dredging. These reviews will include consideration of channel widths, depths, and configurations in terms of potential changes that could reduce the volume of dredging necessary to meet the navigational needs of each project.

ND2. BCDC, in consultation with the other LTMS agencies, will continue to work with area ports within the framework of its joint Seaport planning process within the Metropolitan Transportation Commission to identify potential means to reduce the need for dredging while meeting the navigational needs of each port facility. In addition, the LTMS agencies will continue to work to reduce the need for dredging associated with other projects.

**RF Rehandling Facilities and Dedicated Confined Disposal Facilities** (see Chapter 5)

RF1. The LTMS agencies will address, as appropriate, the issues identified in Table 5.1-3 in site-specific assessments of the development, expansion, or operation of dredged material rehandling facilities or dedicated confined disposal sites.

**SD Special Consideration for "Small Dredger" Projects** (see Chapters 5 and 6)

SD1. The LTMS agencies will give special consideration in the LTMS Management Plan to minimizing potential economic impacts to “small dredger” projects, for example, by reserving some of the available capacity at the least expensive disposal or reuse sites or by other means. The specific approach/policy for minimizing economic impacts to small dredgers will be established with public input as the LTMS Management Plan is developed, and will be incorporated as appropriate under the overall Management Plan in the specific Site Management and Monitoring Plan(s) for the in-Bay sites.

SD2. 250,000 cy of the in-Bay disposal capacity under the disposal cap will be reserved each year for small dredgers. This small dredger set-aside volume will not be decreased over time. Further, small dredgers will be allowed to exceed the 250,000 cy set-aside in any given year, on a case-by-case basis. Small dredgers will still be required, on a case-by-case basis, to evaluate and implement UWR or ocean disposal if feasible and practicable.

**SMM Site Management and Monitoring** (see Chapter 5)

SMM1. The LTMS agencies will develop and implement site management and monitoring plans for all multi-user placement or disposal sites. (Note: The development of individual Site Management and Monitoring Plans for single-user placement and disposal sites, such as the Suisun Bay and San Francisco Bar sites, is not necessary because the project environmental and management documents for single-user sites include such management and monitoring plan development requirements.)

These plans will specify the site use parameters necessary to ensure that impacts are minimized and/or benefits are realized. The plans will also specify the monitoring requirements and post-closure activities as appropriate for each site. Site management and monitoring plans will identify specific conditions that would constitute acceptable site performance, as well as adjustments to site use parameters (including termination of continued site use) that would be triggered by specific findings of non-performance.

SMM2. The LTMS agencies will provide opportunity for public input and comment on proposed site management and monitoring plans for new disposal or placement sites, and on proposed substantive revisions to existing plans. Information from site monitoring efforts will be made available to the public, and opportunity for comment will also be provided as part of the periodic review for existing sites.

**SQ** **Material Suitability and Sediment Quality Testing** (see Chapter 5)

SQ1. The LTMS agencies will evaluate proposals for new dredged material placement or disposal sites, consistent with alternatives analysis requirements of state and federal laws (e.g., CEQA, NEPA, and the Clean Water Act).

SQ2. For any particular site, the LTMS agencies will address all of the relevant contaminant exposure pathways of concern (as described in Chapter 3 of this EIS/EIR and in other agency guidance documents as appropriate) as part of the environmental assessment.

SQ3. The LTMS agencies will include specific conditions in authorizations for dredged material disposal or reuse sites that stipulate appropriate design or operational features necessary to control all contaminant pathways identified as being of concern at a given site. Control measures will be adequate to manage the worst-case material that would be considered for placement at a specific site.

SQ4. Only dredged material determined by the LTMS agencies to be suitable for the proposed placement or disposal option will be authorized for such placement or disposal. The LTMS agencies will require that sediments are adequately characterized for the proposed placement environment or specific disposal site, using appropriate physical, chemical, and biological testing methods, as necessary. Sediment quality evaluations will include consideration of potential effects related to the specific pathways of concern identified for the proposed placement environment or disposal site.

**WR** **Wetland Restoration** (see Chapter 5)

WR1. The LTMS agencies will address, as appropriate, all of the issues identified in Table 5.1-4 in site-specific assessments of proposed wetland restoration projects using dredged material.

b. UWR = Upland/Wetland Reuse
c. Project-specific mitigation measures would be developed on a case-by-case basis.

disposed at dispersive, in-Bay sites compared to No-Action. However, for the purposes of assigning numbers in Table 6.1-8, the reduction in risk from decreased in-Bay disposal is considered instead. The preferred alternative has the least amount of impact/risk for the in-Bay environment because it has the least amount of in-Bay disposal. The other alternatives have low impact/risk for water quality and fish and wildlife habitat from in-Bay disposal and high impact/risk to air quality. The preferred alternative has negligible impact/risk to water quality and fish and wildlife habitat and high impact/risk to air quality from disposal in-Bay.

Alternative 3 and Alternative 2 have the highest benefits to the upland/wetland reuse placement environment of all of the final action alternatives. They have moderate benefits for water quality, fish and wildlife habitat, and special status species for habitat restoration projects. In comparison, these benefits are low for Alternative 1. Alternative 3 and Alternative 2 have some impact/risk, some of which are increased over Alternative 1, in the UWR environment. The preferred alternative has low impact/risk to water quality for levee maintenance projects. This is the case for all of the final action alternatives. However, the impact/risk for Alternative 3 and Alternative 2 is low to fish and wildlife habitat for habitat restoration projects. This is an increase over negligible ratings given to Alternative 1. In addition, the transportation system impact/risk for Alternative 3 and Alternative 2 are high for levee maintenance and rehandling facility projects. This compares with a negligible rating for Alternative 1.

## 6.2 EVALUATION OF THE FINAL ALTERNATIVES AGAINST THE FINAL EVALUATION CRITERIA

The three final “action” alternatives listed above, along with the No-Action alternative, are being considered by the LTMS agencies for implementation as the basis for development of a detailed, comprehensive Management Plan for San Francisco Bay Area dredged material. The evaluation and comparison of these alternatives is based largely on the environment-specific “Generic Analysis” presented in the preceding pages (section 6.1), and on an assessment of how well each of the final alternatives addresses the broad “evaluation criteria” developed as a result of the LTMS scoping and problem identification process. The evaluation criteria, described in Chapter 2, were developed to address a variety of public concerns about the management of dredged material. They provide for an over-arching comparison of the alternatives, that supplements the resource-by-resource evaluation and comparison presented for the individual placement environments in the Generic Analysis above (section 6.1). The final evaluation criteria include the following:

*Criterion A: Benefits and Risks to Ecological Systems.* How the alternatives compare in terms of overall potential benefits, and risks or impacts, to resources of concern in the ocean, in-Bay, and upland/wetland/reuse environments.

*Criterion B: Regulatory Certainty.* The degree to which each alternative, including the common policy-level mitigation measures, supports an understandable, consistent regulatory framework that provides reasonable predictability for dredging project proponents while assuring the public that significant environmental impacts are being avoided.

*Criterion C: Dredging-Related Economic Sectors.* The effects of the alternatives on different dredging-related socioeconomic sectors of the region.

The remainder of this chapter consists of a general comparison of the No-Action and action alternatives according to these broad evaluation criteria. This is followed by a separate air quality evaluation of the alternatives.

### 6.2.1 Benefits and Risks to Ecological Systems

Each of the three action alternatives can be implemented without significant adverse impacts to the environment. However, the three alternatives differ from each other, and from No-Action, in terms of (1) the degree to which benefits may be realized from reuse of dredged material as a resource; and (2) the degree to which risks to the already-stressed Estuary system may be reduced by reducing disposal at the dispersive in-Bay sites. Please see Table 6.2-1 for a summary of the discussion below.

#### 6.2.1.1 No-Action (Current Conditions)

No-Action is characterized by high levels of in-Bay disposal, and low levels of ocean disposal and upland or wetland reuse.

*Benefits*

The least degree of environmental benefits of any alternative would occur under No-Action, because the lowest volumes of dredged material would go to

**Table 6.2-1. Comparison of Alternatives with Respect to Benefits and Risks to Ecological Systems**

| *Alternative* | *Significance of Benefit** | *Significance of Impact/Risk after Mitigation** |
|---|---|---|
| Alternative 1 | +1 | -1 |
| Alternative 2 | +2 | -2 |
| Alternative 3 | +2 | -1 |
| No-Action | 0 | -2 |
| * Potential Benefits: +3 = High Benefit; +2 = Moderate Benefit; +1 = Low Benefit; 0 = Negligible Benefit.<br>Potential Impacts: -3 = High Impact; -2 = Moderate Impact; -1 = Low Impact; 0 = Negligible Impact. | | |

beneficial reuse. The majority of all material dredged throughout the Estuary would be disposed as a waste at existing in-Bay sites. Reuse projects that are constructed would continue to occur on an opportunistic, case-by-case basis and would be associated mainly with large, new work projects. Since multi-user beneficial reuse sites would not exist, the smallest number of beneficial reuse projects would be expected under this alternative. Therefore, no benefit to ecological systems is expected under No-Action.

*Risks/Impacts*

Environmental risks and impacts to the in-Bay placement environment are greater under No-Action than under any of the action alternatives. This is because, on average, twice as much dredged material would be disposed at the existing, dispersive in-Bay sites under this alternative than under Alternatives 1 or 2, and four times as much as under Alternative 3 (see Figure 6.1-1 for schematic of each alternative). As discussed in the Generic Analysis, the potential adverse impacts of in-Bay disposal are related primarily to the occurrence of high-frequency disposal activities occurring at the disposal sites. High levels of in-Bay disposal would mean that high-frequency disposal could occur relatively often. No-Action carries a moderate risk of cumulative impacts to water quality and to fish and wildlife habitat quality, and a low risk of causing adverse effects to some special status species. At the same time, the risks and impacts to the ocean and upland/wetland/reuse environments would be as low as the lowest of the action alternatives for each of these environments (Alternative 2 for the ocean, and Alternative 1 for upland/wetland/reuse). Therefore, due to the potential impacts to the in-Bay environment, water quality, and fish and wildlife habitat, No-Action poses a moderate risk of impact to ecological systems.

### 6.2.1.2 Alternative 1 — Emphasize Aquatic Disposal (Minimal UWR)

Alternative 1 includes medium levels of disposal at the existing in-Bay and ocean sites, and only low placement volumes at upland or wetland reuse sites. This alternative thus emphasizes aquatic disposal overall: 80 percent of all SUAD material, equally divided between sites in the Estuary and in the ocean, would be disposed at aquatic sites *without realizing the potential for regional environmental benefits*.

*Benefits*

Alternative 1 would have the least environmental benefits of any of the "action" alternatives, because only low volumes of dredged material would go into beneficial reuse applications, including low levels of benefit to fish and wildlife habitat, and to special status species.

However, greater environmental benefits would be expected under this alternative than under No-Action, because coordinated, interagency effort would be expected to result in at least some multi-user reuse sites being developed (only opportunistically developed, project-specific reuse sites are anticipated under No-Action).

Multi-user sites are considered to result in greater benefits because more comprehensive planning can generally go into location, design, and monitoring considerations. Multi-user habitat restoration sites also have the potential to be larger, and to provide for a broader range of habitat types, than would single projects that may have a more specific emphasis.

Alternative 1 would also benefit the in-Bay environment to a degree, by reducing the overall volume of dredged material being disposed at dispersive, in-Bay sites compared to No-Action. However, for the purposes of assigning numbers in Table 6.2-1, reduction in risk from decreased in-Bay disposal is considered instead. Even though Alternative 1 (and Alternative 2) includes the greatest volume of in-Bay disposal of the action alternatives, this still represents reducing No-Action volumes by one half, as a long-term average. Overall, Alternative 1 provides a low benefit to ecological systems over No-Action.

*Risks/Impacts*

Alternative 1 (and Alternative 2) would have the highest level of risk to in-Bay resources of the action alternatives, since medium volumes of dredged material would be disposed at in-Bay sites. As discussed in the Generic Analysis, the potential adverse impacts of in-Bay disposal are related primarily to the occurrence of high-frequency disposal activities occurring at the disposal sites. Medium levels of in-Bay disposal would mean that high-frequency disposal could still occasionally occur. Alternative 1 (and Alternative 2) carries a low risk of cumulative impacts to water quality and to fish and wildlife habitat quality. However, these risks are substantially reduced relative to No-Action. Regarding the ocean, medium volumes of disposal are not expected to result in any adverse effects outside the disposal site. Alternative 1 would have the least risk of adverse impact in the upland/wetland/reuse environment of any of the action alternatives because only low volumes of dredged material would be placed in that environment, similar to No-Action. Therefore, Alternative 1 has an overall low risk of impact to ecological systems compared to No-Action.

### 6.2.1.3 Alternative 2 — Balance Upland/Wetland Reuse and In-Bay Disposal (Minimal Ocean Disposal)

Alternative 2 includes medium levels of disposal at the existing in-Bay sites, low disposal volumes in the ocean, and medium placement volumes at upland or wetland reuse sites. This alternative thus realizes additional environmental benefits from reuse of dredged material as a resource, but retains the risks associated with relatively high volumes of disposal within the Estuary.

*Benefits*

Alternative 2 (and Alternative 3) would have the greatest environmental benefits of any of the action alternatives, because the greatest volumes of dredged material would go into beneficial reuse applications. Moderate benefits to fish and wildlife habitat and to special status species, and low levels of benefit to water quality, would be expected.

Alternative 2 would also benefit the in-Bay environment to a degree, by reducing the overall volume of dredged material being disposed at dispersive, in-Bay sites compared to No-Action. However for the purposes of assigning numbers in Table 6.2-1, reduction in risk from decreased in-Bay disposal in considered instead. Even though Alternative 2 (and Alternative 1) includes the greatest volume of in-Bay disposal of the action alternatives, this still represents reducing No-Action volumes by one half, as a long-term average. Overall, Alternative 2 provides moderate benefits to ecological systems over No-Action.

*Risks/Impacts*

Alternative 2 (and Alternative 1) would have the highest level of risk to in-Bay resources of the action alternatives, since medium volumes of dredged material would be disposed at in-Bay sites. As discussed in the Generic Analysis, the potential adverse impacts of in-Bay disposal are related primarily to the occurrence of high-frequency disposal activities occurring at the disposal sites. Medium levels of in-Bay disposal would mean that high-frequency disposal could still occasionally occur. Alternative 2 (and Alternative 1) carries a low risk of cumulative impacts to water quality and to fish and wildlife habitat quality. However, these risks are substantially reduced relative to No-Action. Regarding the ocean, low volumes of disposal are not expected to result in any adverse effects outside the disposal site. Potential ocean impacts are less under this alternative than the other action alternatives, and are similar to No-Action. However, Alternative 2 would have a low risk of adverse impact in the upland/wetland/reuse environment because, at medium placement volumes, some sensitive resource areas could not be completely avoided. Overall, because this alternative has a low risk of impact in both the upland/wetland/reuse and in-Bay environments, it is assigned a moderate level of impact/risk to ecological systems.

### 6.2.1.4 Alternative 3 — Balance Upland/Wetland Reuse and Ocean Disposal (Minimal In-Bay Disposal)

Alternative 3 includes low disposal volumes at in-Bay sites, medium disposal volumes in the ocean, and medium volumes of upland/wetland/reuse placement. This alternative combines the maximum environmental benefit of any of the action alternatives, with the minimum risks to the Estuary and negligible risks to the ocean.

*Benefits*

Alternative 3 (and Alternative 2) would have the greatest environmental benefits of any of the action alternatives, because medium volumes of dredged material would go into beneficial reuse applications. Moderate benefits to fish and wildlife habitat and to special status species, and low levels of benefit to water quality, would be expected. In addition, Alternative 3 would benefit the in-Bay environment to a greater degree than the other action alternatives, because the overall volume of dredged material being disposed at dispersive, in-Bay sites would be reduced to the greatest extent. This would represent a very substantial reduction compared to No-Action. However, for the purposes of assigning numbers in Table 6.2-1, reduction in risk from decreased in-Bay disposal is considered instead.

*Risks/Impacts*

Alternative 3 would have the lowest level of risk to in-Bay resources of the action alternatives, since only low volumes of dredged material would be disposed at in-Bay sites. As discussed in the Generic Analysis, the potential adverse impacts of in-Bay disposal are related primarily to the occurrence of high-frequency disposal activities occurring at the disposal sites. At low levels of in-Bay disposal, high-frequency disposal activities would generally be avoidable. Alternative 3 carries only a negligible risk of cumulative impacts to water quality and to aquatic fish and wildlife habitat quality; and these low risk levels are substantially reduced relative to No-Action. Medium volumes of disposal at the ocean site are not expected to result in any adverse effects outside the disposal site. However, Alternative 3 (and Alternative 2) would also have a low risk of adverse impact in the upland/wetland/reuse environment because, at medium placement volumes, some sensitive resource areas could not be completely avoided. Alternative 3 has the lowest level of risk of impact compared to the other alternatives. Overall, the risk of impact to ecological systems is considered low compared to No-Action.

### 6.2.2 Regulatory Certainty

The issue of concern addressed by this evaluation criterion is the need to improve coordination and integration of agency policies governing the management of dredged material. In this section, the EIS/EIR alternatives are compared in terms of the degree to which, in conjunction with the common policy-level mitigation measures, they would support an understandable, consistent regulatory framework that provides reasonable predictability for dredging project proponents while assuring the public that significant environmental impacts are being avoided. Please see Table 6.2-2 for a summary of the discussion below.

**Table 6.2-2. Comparison of Alternatives with Respect to Regulatory Certainty**

| ***Parameter*** | ***Alternative 1*** | ***Alternative 2*** | ***Alternative 3*** | ***No-Action*** |
|---|---|---|---|---|
| Regulatory Certainty for Disposal of SUAD material | Relatively high in short term, increasing over time | Lower than Alternative 1 in short term, increasing over time | Lower than Alternative 1 in short term, increasing over time | Relatively high in short term; uncertain over the long term |
| Regulatory Certainty for Disposal of NUAD material | Low in short term, increasing over time | Same as Alternative 1 | Same as Alternative 1 | Same as Alternative 1 |
| Regulatory Certainty in Terms of Enhancement of Overall Environmental Quality | Low | Medium | High | Lowest |

With the exception of No-Action, each of the alternative long-term dredged material management approaches evaluated in this EIS/EIR would result in improvements that would increase regulatory certainty for both dredging interests and the public. The amount of improvement in regulatory certainty varies somewhat with the alternatives. However, the major factor controlling the degree of regulatory certainty that can be achieved under any of the action alternatives is the degree to which any alternative can actually be implemented. In some cases, the action alternatives cannot be fully implemented by the LTMS agencies under current laws. For example, it is currently outside the LTMS agencies' authorities to acquire, operate, and/or fund upland/wetland reuse or disposal sites, or rehandling facilities. If future legislative changes were to remove this constraint and these kinds of sites were subsequently developed, many more options for management of dredged material would suddenly exist and regulatory certainty would be dramatically increased. Similarly, for federal maintenance dredging or new construction projects, it is generally outside the COE's current authority to share any increased costs associated with confined disposal or reuse of material that cannot be disposed at traditional (in-Bay) disposal sites. As above, if the COE's national cost-share requirements were modified and upland or wetland reuse or disposal sites were subsequently developed, new options for management of dredged material would suddenly exist and regulatory certainty would be dramatically increased. Of course, these same benefits would also come about if private parties were to develop and operate on their own multi-user upland or wetland reuse or disposal sites, or rehandling facilities. However, until such sites become available, the regulatory uncertainties described above would remain.

Any of the action alternatives would transition over time toward full implementation of its distribution goals, particularly as upland or wetland reuse or disposal sites, or rehandling facilities, become available.

### 6.2.2.1 No-Action (Current Conditions)

The current conditions represented by the No-Action alternative already include a variety of significant improvements over the pre-LTMS dredged material management situation. These include the following: improved sediment quality testing requirements for in-Bay disposal, instituted in the LTMS agencies' joint Public Notice 93-2; more active management of the Alcatraz disposal site to minimize continued physical mounding problems, instituted in COE Public Notice 93-3 and the BCDC "Roadmap;" and formal designation by EPA of the SF-DODS, which provided the first large-scale, multi-user alternative to in-Bay disposal. In addition, demonstration projects on the beneficial reuse of dredged material for levee maintenance (Jersey Island project) and for tidal wetlands restoration (Sonoma Baylands project) have provided valuable experience in how to design these kinds of projects to ensure their success. Finally, successful reuse of both SUAD- and NUAD-class dredged material has been ongoing at certain area landfills, demonstrating that this approach can be practical in this area. Together, these events reflect a substantially more predictable regulatory environment than was the case during the days of "mudlock" in the late 1980s.

However, current regulatory conditions are still fairly "uncertain" and unpredictable, both for dredging interests and the public. Currently, for example:

- Adequate, multi-user disposal capacity does not exist to manage all of the NUAD-class material likely to need dredging over the next few years;
- Few options are available for the beneficial reuse of dredged material — in particular, there are no multi-user sites for habitat restoration, levee use, or construction fill purposes;
- Rehandling capacity, which can facilitate many kinds of reuse and non-aquatic disposal, is especially limited regionally — no large-scale, multi-user rehandling facilities exist today;
- The local project review/permitting process remains complicated and time-consuming, without established procedures for identifying the concerns or requirements of all appropriate agencies early in the planning process;
- In some cases, such as landfill use, testing requirements are not standardized; and
- Federal cost-sharing requirements and other regulations effectively discourage pursuing alternatives to the region's historic practice of in-Bay disposal.

These factors mean that dredging project proponents continue to be left more or less "on their own" when it comes to, for example: evaluating alternatives for their projects; identifying and acquiring upland disposal sites if their projects should include any NUAD material; identifying and negotiating for capacity to rehandle any of their dredged material that must be dewatered before being transported to a final placement site; and negotiating testing requirements with individual landfills. Even when project proponents are interested in the beneficial reuse of their SUAD-class dredged material, under current conditions they generally must identify, arrange for, and pay any cost-difference associated with such use. If appropriate upland or confined disposal locations with adequate capacity cannot be found or are not affordable, dredging project proponents have little choice but to reconfigure their project (if possible) to avoid dredging the NUAD material, or leaving the NUAD material in place and suffering the logistic or economic consequences until circumstances change. The consequences of inadequately maintained navigation channels can be severe to others, as well, and can include risks to public health and safety if ships run aground, collide, or cause spills.

The general public also faces a degree of uncertainty, even given the improvements in the regulatory system since the inception of the LTMS. In particular, although significant adverse effects are avoided under current management practice, little of the potential environmental benefit of reusing dredged material as a resource is being realized. At the same time, as noted above, NUAD-class dredged material is often left in place if dredgers cannot identify appropriate or adequate confined disposal capacity. Therefore, public concerns about overall environmental trends in the region, and about the overall health of the Estuary, may not be satisfactorily addressed.

Overall, the No-Action alternative would provide the lowest degree of regulatory certainty of any of the alternatives, in both the short term and over the 50-year LTMS planning period.

#### 6.2.2.2 Alternative 1 — Emphasize Aquatic Disposal (Minimal UWR)

This alternative includes the least amount of change from current conditions, in that most material would be disposed at existing unconfined aquatic disposal sites within the Estuary and in the ocean. In addition, since this is an action alternative, it would include implementation of the policy-level mitigation measures described in Chapter 5. These include establishment of a Dredged Material Management Office (DMMO) that would coordinate and, where appropriate, streamline the regulatory processes of the LTMS agencies.

From the standpoint of dredging project proponents, Alternative 1 would have a relatively high degree of regulatory certainty during the initial years of LTMS implementation. This is particularly true for dredging projects that are predominantly comprised of SUAD-class material. The existing aquatic disposal sites would be immediately able to handle the average annual volumes of material projected to go to them, without significant adverse environmental effects. In this regard, permitting would be relatively straightforward for most material. Projects having substantial quantities of NUAD material, on the other hand, would face a degree of uncertainty in the short term, similar to that under No-Action. Until multi-user upland/wetland reuse or confined disposal facilities could be made available, project sponsors would still be expected to identify and acquire on their own suitable disposal options for NUAD material. In the long run, as Alternative 1 moves toward full implementation, regulatory certainty would be improved for both SUAD and NUAD material.

For members of the public concerned about enhancing overall environmental quality by reusing dredged material for beneficial purposes rather than disposing of it as a waste, this Alternative provides the lowest level of certainty of any of the action alternatives. Although Alternative 1 would eventually result in a greater degree of beneficial reuse than No-Action, it provides less than either Alternative 2 or Alternative 3. Especially in the initial years of LTMS implementation, only relatively small volumes of dredged material would be expected to go to beneficial reuse projects.

#### 6.2.2.3 Alternative 2 — Balance Upland/Wetland Reuse and In-Bay Disposal (Minimal Ocean Disposal)

This alternative includes substantially less in-Bay disposal than No-Action, and more beneficial reuse of dredged material than either No-Action or Alternative 1. However, only limited ocean disposal would occur under Alternative 2.

Dredging interests would find regulatory certainty to be improved over No-Action, but in the short-term to be lower than Alternative 1 for SUAD-class material since allowable in-Bay disposal volume (coupled with only low levels of ocean disposal) would not always be sufficient to manage all of the SUAD material likely to be dredged. This could mean that some projects would be delayed or otherwise adversely affected. This situation would not improve until multi-user upland or wetland placement capacity could be made available. For NUAD materials, the situation would be the same as for Alternative 1: dredgers would face a degree of uncertainty in the short term similar to that under No-Action, but in the long run regulatory certainty would be improved for both SUAD and NUAD material.

In terms of public concerns about improving the overall health of the Estuary, regulatory certainty under this alternative would be intermediate between alternatives 1 and 3. At full implementation, Alternative 2 would result in the largest volume of dredged material being reused for beneficial purposes, and the least being disposed as waste, of any of the action alternatives (the same as Alternative 3). In this regard, Alternative 2 provides the highest level of certainty that environmental enhancement will occur. However, this alternative retains a substantial level of in-Bay disposal. In this regard, potential cumulative stresses on the Estuary would not be reduced as much as would occur under Alternative 3.

#### 6.2.2.4 Alternative 3 — Balance Upland/Wetland Reuse and Ocean Disposal (Minimal In-Bay Disposal)

This alternative combines the highest level of upland/wetland reuse, and the lowest level of in-Bay disposal, of any of the alternatives.

Similar to Alternative 2, dredging interests could find regulatory certainty to be improved over No-Action, but in the short term to be lower than Alternative 1 for SUAD-class material. The SF-DODS does not have a known physical capacity limit; however, if an allowable ocean disposal volume were established that (along with only low in-Bay disposal) was insufficient to manage all of the SUAD material likely to be dredged, some projects would be delayed or otherwise adversely affected. This situation would not improve until multi-user upland or wetland placement capacity could be made available. However, short-term regulatory certainty would not be lowered in this manner, if the ocean site's allowable disposal volume limit were left at its current level (which is sufficient to handle all SUAD material that would be dredged in an average year). For NUAD materials, the situation would be the same as for Alternative 1: dredgers would face a degree of uncertainty in the short term similar to that under No-Action, but in the long run regulatory certainty would be improved for both SUAD and NUAD material.

In terms of public concerns about improving the overall health of the Estuary, regulatory certainty would be greatest under this alternative. At full implementation, Alternative 3 would result in the largest volume of dredged material being reused for beneficial purposes, and the least being disposed as waste, of any of the action alternatives (the same as Alternative 2). In this regard, Alternative 3 provides the highest level of certainty that environmental enhancement will occur. In addition, this alternative has the lowest level of in-Bay disposal of any of the alternatives. In this regard, potential cumulative stresses on the Estuary would be reduced more than would be the case under any of the other alternatives.

### 6.2.3 Dredging-Related Economic Sectors

This evaluation explores the direct costs associated with the LTMS alternatives and their potential effects on the socioeconomic environment of the LTMS planning region. The socioeconomic effects of the LTMS alternatives were evaluated by completing four major tasks: estimation of total dredging and disposal costs over the 50-year planning period, estimation of federal versus non-federal costs, comparison of costs under the LTMS alternatives to costs under No-Action conditions, and assessment of the regional socioeconomic effects of cost differences.

The cost estimates prepared for this DEIS/EIR are planning-level estimates that will be used to compare the relative dredging and disposal costs of the four alternatives. Other parts of the DEIS/EIR evaluate tools and mechanisms that may be required to finance these costs.

The planning-level estimates prepared for this report do not specifically reflect the range of dredging and disposal costs that may be encountered by all projects or project sponsors. As planning-level estimates of relative costs over a 50-year period, many simplifying assumptions were required for the analysis. The incorporation of numerous simplifying assumptions and the consideration of costs over a lengthy planning period necessarily introduce considerable variability and uncertainty into the estimates. Nevertheless, these cost estimates provide a consistent means to describe and compare the alternatives considered in this programmatic EIS/EIR.

Actual overall costs associated with the alternatives will likely be less than those estimated here, as this analysis has incorporated conservative assumptions in order to capture possible costs associated with a wide range of dredging and disposal activities. In particular, three major assumptions incorporated here make the overall cost estimates higher than what is likely to actually be the case:

1. The high estimate of total dredged material volume is assumed. Actual long-term dredging volumes may be much lower.

2. Immediate and full implementation of upland disposal is assumed. In reality, targeted capacity for upland disposal will be phased in over time, as sites are developed. In addition, it is likely that costs for upland disposal will decline with increased experience in upland site development and management.

3. Existing cost-sharing requirements and regulatory policies are assumed to apply throughout the 50-year planning period. The financing and institutional options outlined in Chapter 7, if implemented, could lower the overall costs associated with each alternative, and would change the allocation of costs among local and federal sponsors.

Please see Table 6.2-3 for a comparison of the alternatives in terms of dredging-related economic sectors. It is a summary of the following discussion.

### 6.2.3.1 Background on Cost Estimates

Total cost estimates were prepared by the LTMS agencies for the dredging and disposal of clean dredge material over the 50-year planning period for No-Action conditions and for the three LTMS alternatives. The methods, data, and assumptions used to develop cost estimates and volume distributions among placement environments are described in Appendix P (Derivation of Dredging and Disposal Costs).

This analysis examined three major factors that influence total costs and the incidence of those costs: the activities encompassed by each alternatives; the types of dredging work that are typically conducted; and the relative share of the costs borne by federal and non-federal entities.

This analysis divided dredging and disposal activities among three major categories of dredging work (referred to in this document as *work categories*): maintenance, new work, and small dredging projects (defined as projects with a channel depth of less than 12 feet below MLLW). The work categories have important implications for calculating dredging and disposal costs and identifying the sectors that will bear those costs.

Several factors affect the costs faced by dredgers for the three work categories. For example, in many cases the volume of material dredged will provide economies of scale for larger projects, and the composition of the dredged material may vary among the work categories, affecting the equipment and Table 6.2-2. Comparison of Alternatives with Respect to Regulatory Certainty methods needed for dredging and disposal. In addition, the financing available for dredging and disposal differs among the work categories.

The dredging/disposal activities that were examined to develop the cost estimates are summarized in the text box below. Estimates of dredging and placement unit costs are based on a Gahagan & Bryant model used to estimate dredging bid calculations. A high-cost and low-cost estimate was developed for the various work categories and placement environments. The unit costs for each activity vary among the placement environments based on factors such as transport distance to disposal sites, site preparation requirements, and disposal site operations and maintenance requirements.

**Table 6.2-3. Comparison of Alternatives with Respect to Dredging-Related Economic Sectors**

| ***Parameter*** | ***Alternative 1*** | ***Alternative 2*** | ***Alternative 3*** | ***No-Action*** |
|---|---|---|---|---|
| Potential socioeconomic impact (worst case)* | Low | Medium | High | Lowest |

* See section 6.2.3. The LTMS agencies do not expect that these worst-case cost increases discussed in section 6.2.3 will actually occur because the estimates use worst-cast assumptions and the alternative must be practicable on a case-by-case basis.

**Activities Considered in Cost Estimates**

**Testing**

- Sediment evaluation and testing to determine its suitability for disposal

**Dredging and Placement**

- Dredging: Mobilizing/demobilizing dredge equipment and dredging a project site
- Transport: Hauling dredged material to a disposal or rehandling site
- Placement: Placing dredged material at the site
- Rehandling (for certain disposal sites): Drying dredged material at a rehandling facility, excavating the dried material, and hauling the material to a final disposal site

**Site Development and Management**

- Initial site preparation (e.g., initial site acquisition, environmental assessments and mitigation, planning, design, engineering, construction, and construction management)
- Site operations and maintenance
- Site monitoring

The range of unit costs for dredging and disposal, including testing, are summarized in Table 6.2-4. See Appendix P for a description of the Gahagan and Bryant model and the model output used to develop unit costs for the high- and low-cost scenarios. Site development, site operations, and monitoring costs were estimated from other sources, and are summarized in Table 6.2-5.

Total 50-year cost estimates were prepared for each of the four alternatives using the volumes attributed to each alternative, the distribution of material among the three work categories explained in Appendix P, and the range of unit costs shown in tables 6.2-4 and 6.2-5. Table 6.2-6 presents estimates of the cumulative costs of dredging and disposing of the entire 237 mcy of SUAD material over the 50-year study period. Monitoring costs for ocean, in-Bay, and tidal wetland disposal are included in the total costs for each alternative, and allocated among the work categories by the relative percentage each category contributes to the placement environment.

Using a simplified approach to existing federal cost-sharing requirements, Table 6.2-7 shows the estimates of federal and non-federal costs associated with each alternative. The assumptions used to develop these estimates are explained in the notes to Table 6.2-7 and in Appendix P. Many factors determine the actual split of costs between the federal government and local project sponsors. This analysis should only be used to assess the *relative* change in federal and non-federal costs across the LTMS alternatives.

Where appropriate, this analysis has incorporated conservative assumptions in order to capture possible costs associated with the range of dredging and disposal activities. In general, these assumptions mean that the estimates of overall costs are likely to be higher than actual costs, as described above. Table 6.2-8 summarizes the potential effects of the assumptions on the estimates of unit costs and total costs.

**Table 6.2-4. Estimated Unit Costs for Testing, Dredging, and Disposal** ($/cubic yard)

| *Activity* | *In-Bay* | *Ocean* | UPLAND, WETLAND REUSE | | *Landfill (b)* |
|---|---|---|---|---|---|
| | | | *Tidal* | *Levee* | |
| **Maintenance (100% soft material) (a)** | | | | | |
| Testing (c) | 0.39-1.65 | 0.44-1.91 | 0.10-0.12 | 0.10-0.12 | 0.10-0.12 |
| Mobilization (d) | 0.06-0.56 | 0.06-0.56 | 0.42-4.46 | 0.11-1.12 | 0.42-4.46 |
| Dredging (e) | 1.74-1.79 | 1.68-1.69 | 1.69-1.66 | 1.68-1.74 | 1.66-1.69 |
| Transport f) | 1.21-2.18 | 5.04-5.99 | 2.12-4.96 | 2.18-5.99 | 2.12-4.96 |
| Placement (g) | 0 | 0 | 2.19-3.44 | 2.00 (i) | 2.19-3.44 |
| Rehandling (h) | NA | NA | NA | NA | 2.23-5.26 |
| **Total** | **3.45-6.13** | **7.23-10.14** | **6.52-14.64** | **6.13-10.91** | **8.75-19.90** |
| **New Work (50% hard/50% soft material) (j)** | | | | | |
| Testing | 0.12-1.65 | 0.13-1.91 | 0.09-0.12 | 0.09-0.12 | 0.09-0.12 |
| Mobilization | 0.02-0.56 | 0.02-0.56 | 0.13-4.46 | 0.03-1.12 | 0.13-4.46 |
| Dredging | 2.29-2.35 | 2.22-2.23 | 2.19-2.22 | 2.23-2.29 | 2.19-2.22 |
| Transport | 1.58-2.87 | 5.38-6.62 | 2.79-5.27 | 2.87-5.38 | 2.79-5.27 |
| Placement | 0 | 0 | 2.88-4.54 | 2.00 | 2.88-4.54 |
| Rehandling | NA | NA | NA | NA | 2.23-5.26 |
| **Total** | **4.07-7.37** | **7.76-11.31** | **8.11-16.58** | **7.28-10.85** | **10.34-21.84** |
| **Small Dredge (100% soft material) (k)** | | | | | |
| Testing | 3.30-8.25 | 3.81-9.53 | 0.17-0.49 | 0.17-0.49 | 0.17-0.49 |
| Mobilization | 1.68-8.40 (l) | 1.68-8.40 | 3.28-16.40 | 3.28-16.48 | 3.28-16.40 |
| Dredging | 1.74-1.79 | 1.68-1.69 | 1.66-1.69 | 1.68-1.74 | 1.66-1.69 |
| Transport | 1.21-2.18 | 5.04-5.99 | 2.12-4.96 | 2.18-5.99 | 2.12-4.96 |
| Placement (m) | 0 | 0 | 2.00 | 2.00 | 2.00 |
| Rehandling | NA | NA | NA | NA | 2.23-5.26 |
| **Total** | **7.98-20.57** | **12.22-25.60** | **9.26-25.51** | **9.37-26.56** | **11.49-30.77** |

For a complete explanation of sources and assumptions, see Appendix N.

a. Maintenance material is typically fine-grained silts and clays that are easily dredged.
b. Represents costs associated with establishing a rehandling site. Costs based on assessment of Mare Island, Rio Vista Airport Borrow Pit, Leonard Ranch and Cargill rehandling sites (LTMS 1994e).
c. Testing costs for ocean based on Green Book, for in-Bay based on Inland Testing Manual, and for UWR on WET test. Ranges based on assumed volumes for low and high cost scenarios. See Tables 9 and 10 in Appendix N for testing cost derivation.
d. Based on Gahagan & Bryant bid model for a given set of equipment. See Appendix N for explanation of bid model. Unit costs derived by dividing mobilization cost by assumed volumes for low and high scenarios listed in Table 6.2-3.
e. Based on Gahagan & Bryant bid model for a given set of equipment. See Appendix N for explanation of bid model. Unit costs derived by dividing dredging cost by average productivity of the particular equipment set. Slight variations in dredging costs due to differences in equipment assumed for each placement environment.
f. Based on distances assumed in Low and High scenarios (see Appendix P: Assumptions for Scenarios)
g. Placement costs include cost of equipment and labor needed for placing dredged material at the disposal site. No placement costs were assumed for in-Bay and ocean disposal, assuming the use of bottom-dump scows.
h. Rehandling costs based on *Analysis of the Potential for Use of Dredged Material at Landfills* (BCDC 1995a). Includes costs of excavating, loading, hauling and unloading dried material from rehandling facility.
i. Placement cost based on use of clamshell dredge with similar cost characteristics to dredging operation.
j. Accounts for inclusion of harder material (unconsolidated sand, or hard-packed deposits of ancient muds or sands). Hard material encountered in new work projects may require different kinds of equipment, and less production and higher unit costs than would be experienced by dredging maintenance material.
k. Includes dredging projects with channel depths of 12 feet below MLLW or less. Harder material is generally not encountered when dredging such shallow channels.
l. Mobilization costs are very sensitive to dredging volumes, because they represent fixed costs that must be spread across the entire project volume.
m. Assumes the use of mechanical placement (clamshell dredge vs. hydraulic offloader and pipeline) at all disposal sites, with cost characteristics similar to levee placement. Assumes that small dredgers most likely will not be required to establish offloading facilities at any given placement environment due to the

**Table 6.2-5. Estimated Unit Costs for Site Preparation and Management**

| *Activity* | *In-Bay* | *Ocean* | UPLAND/WETLAND REUSE | | *Landfill* (e) |
|---|---|---|---|---|---|
| | | | *Tidal Wetlands* | *Levee* | |
| Initial site prep (a) | 0.00 (b) | 0.00 (b) | 0.60-1.21 (c) | 1.84-2.21 (d) | 0.51-1.18 (e) |
| Site operations/maintenance | NA (f) | NA | 0.02-0.03 (c) | 0.00 | 0.35-0.39 (e) |
| Site monitoring | NA (g) | NA (g) | NA (h) | 0.27-0.34 (i) | 0 (j) |
| **Total** | **0.00** | **0.00** | **0.62-1.24** | **2.11-2.55** | **0.86-1.57** |

*Notes*:
a. Initial site preparation includes land acquisition, construction, mitigation, engineering, design, environmental, planning and construction management costs.
b. No site preparation costs were assumed for the ocean and in-Bay sites as these site are currently operational.
c. Based on a cost associated with Hamilton Air Force Base and North Point properties (LTMS 1994e). See page X of that reference for more details.
d. Site construction cost of $147,000 per levee mile based on Jersey Island levee rehabilitation project (LTMS 1994e). Planning, engineering, design and construction management costs estimated to equal $15,000 - $50,000 per levee mile based on Jersey Island project.
e. Represents costs associated with establishing a rehandling site. Costs based on assessment of Mare Island, Rio Vista Airport Borrow Pit, Leonard Ranch and Cargill rehandling sites (LTMS 1994e).
f. No site operations and maintenance costs associated with in-Bay and ocean disposal.
g. Site monitoring at ocean, and in-Bay disposal represents a fixed cost that will not vary with volume. The cost of monitoring is included in the calculation of total costs. See Appendix N for details of monitoring cost estimates.
h. See text for explanation of costs for site monitoring at tidal wetlands.
i. Based on costs of $24,000 - $30,000 per levee mile (personal communication, E. Larson).
j. Monitoring costs for the rehandling facility are included in the site operations and maintenance cost.

### 6.2.3.2 Evaluation of Socioeconomic Effects

This section presents an evaluation of the socioeconomic effects of the LTMS policy alternatives. The scope of the evaluation is discussed first. General effects that are common to all of the alternatives are then addressed, followed by a specific evaluation of the No-Action alternative and each of the three action alternatives.

*Scope of the Evaluation*

The cost information included within this EIS/EIR is intended to allow for a full disclosure of the potential effects of each alternative, to allow the public and decisionmakers to assess the comparative costs of the project alternatives, and to allow the public and policymakers to consider whether policies should be considered to offset any disproportional economic effects to different segments of the dredging-related economy. (There is no statutory requirement to make findings concerning the significance of economic effects. The economic effects of a project, by themselves, are not considered impacts on the environment; therefore, no attempt was made to develop significance criteria or to make findings of significance for potential economic effects.)

The economic impacts of the LTMS alternatives are characterized not by the total cost of dredging and disposal under each alternative, but by the *difference* in the cost of each alternative from estimated future costs under existing policies as represented by the No-Action alternative, and among the action alternatives themselves.

The effects of dredging and disposal cost changes on regional economic activity (i.e., regional output and employment) depend on the reactions of individual dredgers to the cost changes. The scope of this analysis does not allow for the assessment of the financial conditions of individual public agencies, such as ports and businesses that conduct dredging work as part of their operations.

**Table 6.2-6. Estimates of Total Costs, by Alternative and Work Category**
(in millions of dollars)

| *Alternative* | *Low Estimate* | *High Estimate* |
|---|---|---|
| **No-Action** | | |
| Maintenance | 883.36 | 1,481.89 |
| New Work | 222.07 | 372.12 |
| Small | 207.47 | 503.75 |
| TOTAL | **1,312.91** | **2,357.76** |
| **Alternative 1** | | |
| Maintenance | 1,086.85 | 1,734.87 |
| New Work | 267.41 | 426.70 |
| Small | 233.78 | 539.48 |
| TOTAL | **1,588.03** | **2,701.06** |
| **Alternative 2** | | |
| Maintenance | 1,116.96 | 2,006.16 |
| New Work | 282.32 | 492.22 |
| Small | 227.71 | 553.58 |
| TOTAL | **1,626.99** | **3,051.96** |
| **Alternative 3** | | |
| Maintenance | 1,250.42 | 2,147.21 |
| New Work | 310.93 | 522.66 |
| Small | 246.46 | 575.80 |
| TOTAL | **1,807.81** | **3,245.67** |

*Notes*: a. Total costs are derived from the unit costs presented in tables 6.2-7 and 6.2-8, the assumed volumes presented in Table 6.2-4, and the relative distribution among the work categories as shown in section 6.2.3.1 above.

b. Total costs for in-Bay disposal include the cost of monitoring. Monitoring costs are estimated by EPA and BCDC to equal on average $1.11 million per year, or $55 million over 50 years. Costs were allocated among the work categories according to the relative percentage of dredged material attributed to each work category.

c. Total costs for ocean disposal include the cost of monitoring. Monitoring costs were estimated by EPA and BCDC to equal on average $600,000 per year, or $30 million over the 50-year planning period. Costs were allocated among the work categories according to the relative percentage of dredged material attributed to each work category.

d. Total costs for tidal wetland disposal include costs for site monitoring. Monitoring costs for tidal wetland restoration sites were estimated by BCDC to be $70,000 per year per project, with an average monitoring period of 15 years. Estimates of total monitoring costs were based on the number and timing of wetland site development estimated by BCDC. Total monitoring costs over the 50 years are estimated to equal $4.2 million for No-Action and Alternative 1, and $10.5 million for Alternatives 2 and 3. Costs were allocated among the work categories according to the relative percentage of dredged material attributed to each work category.

For this long-term, regional, policy-level evaluation, analyzing economic effects at the company or institutional level is infeasible and inappropriate. Instead, this analysis programmatically evaluates possible impacts to categories of industries and dredgers over the course of the 50-year LTMS plan. Generally, private sector- or institutional-level socioeconomic analyses will be addressed during the environmental review of specific projects or policies proposed in the future.

The potential effects on major and small dredgers caused by general cost increases under the LTMS alternatives are qualitatively discussed below in the section titled General Effects Common to All Alternatives. To characterize the magnitude of the cost change for dredging-dependent industries, this analysis compared estimated costs that would be borne by non-federal project sponsors under the LTMS alternatives to costs under No-Action conditions, and among the action alternatives.

(in millions of dollars)

| | LOW RANGE | | | HIGH RANGE | | |
|---|---|---|---|---|---|---|
| ***Alternative*** | ***Fed (b,f)*** | ***Non-Fed*** | ***Total*** | ***Fed*** | ***Non-Fed*** | ***Total*** |
| **No-Action** | | | | | | |
| Maintenance (c) | 762.25 | 121.11 | 883.36 | 1219.08 | 262.80 | 1,481.89 |
| New Work (d) | 170.52 | 51.55 | 222.07 | 279.59 | 92.53 | 372.12 |
| Small Dredger (e) | 121.74 | 85.73 | 207.47 | 297.69 | 206.05 | 503.75 |
| TOTAL | 1,054.51 | 258.40 | 1,312.91 | 1,796.37 | 561.39 | 2,357.76 |
| **Alternative 1** | | | | | | |
| Maintenance | 935.40 | 151.45 | 1086.85 | 1,409.50 | 325.37 | 1,734.87 |
| New Work | 188.60 | 78.81 | 267.41 | 291.17 | 135.54 | 426.70 |
| Small Dredger | 136.69 | 97.09 | 233.78 | 317.69 | 221.79 | 539.48 |
| TOTAL | 1,260.68 | 327.35 | 1,588.03 | 2,018.36 | 682.69 | 2,701.06 |
| **Alternative 2** | | | | | | |
| Maintenance | 902.39 | 214.58 | 1,116.96 | 1,410.78 | 595.38 | 2,006.16 |
| New Work | 188.75 | 93.57 | 282.32 | 291.40 | 200.81 | 492.22 |
| Small Dredger | 130.82 | 96.90 | 227.71 | 317.97 | 235.61 | 553.58 |
| TOTAL | 1,221.95 | 405.04 | 1,626.99 | 2,020.16 | 1,031.81 | 3,051.96 |
| **Alternative 3** | | | | | | |
| Maintenance | 1,022.50 | 227.92 | 1,250.42 | 1,537.73 | 609.48 | 2,147.21 |
| New Work | 200.98 | 109.95 | 310.93 | 299.12 | 223.53 | 522.66 |
| Small Dredger | 142.07 | 104.40 | 246.46 | 331.30 | 244.50 | 575.80 |
| TOTAL | 1,365.55 | 442.26 | 1,807.81 | 2,168.15 | 1,077.52 | 3,245.67 |

*Notes*: a. Cost share based on unit costs presented in tables 6.2-4 and 6.2-5, volume estimates from LTMS alternatives, and relative distribution among work categories estimated in Appendix N. Federal/non-federal cost shares estimated according to methodology explained below.

b. *Disposal to Upland Sites*. For disposal to upland, wetland, and reuse (UWR) sites (i.e., tidal wetlands restoration sites, levee restoration sites, and landfill sites), the federal government was assumed to pay for the proportion of costs represented by the least-cost alternative. For the purposes of this analysis, costs associated with disposal to the ocean site were assumed to represent least-cost conditions. It was assumed that the estimated percentage distribution to the in-Bay site (between 20-40 percent of total material) represents the environmentally-acceptable capacity of the in-Bay site. Once that capacity is reached, federal cost-sharing funds would then be allocated according to the next least-costly, environmentally-acceptable alternative, which is assumed to be ocean disposal. It must be noted, however, that depending on the project, upland disposal may actually qualify as the least-cost alternative after in-Bay site capacity is reached. In that case, total costs to both federal and non-federal sponsors would actually be lower than those calculated here. Dredging and disposal costs above the least-cost condition were assumed to be entirely borne by non-federal sponsors. In addition, all site development and management costs for upland disposal were assumed to be born by the local sponsor.

c. **Maintenance:** <u>*In-Bay and Ocean Disposal*</u>. Approximately 90 percent of major maintenance dredging is either dredged by the federal government (COE, USCG, or USN) or is eligible for federal cost-sharing. For that 90 percent of material, the federal government was assumed to cover 100 percent of all costs, through cost-sharing funds, military budget allocations, and federal agency expenditures on aquatic disposal site development and monitoring. Local sponsors were assumed to pay 100 percent of the costs for dredging and disposing the remaining 10 percent of material generated by major non-federal dredging.

d. **New Work:** <u>*In-Bay and Ocean Disposal.*</u> Approximately 90 percent of the material generated by new work is eligible for federal cost sharing. The remaining 10 percent comes from the non-federal portions of new work projects, such as deepening berths and loading facilities. Of that, the federal government was assumed to cover 75 percent of total costs and non-federal sponsors were assumed to be responsible for the remaining 25 percent of costs. For the remaining 10 percent of material local sponsors were assumed to cover 100 percent of the total costs.

e. **Small Dredger:** <u>*In-Bay and Ocean Disposal*</u>. Federally authorized channels account for approximately 60 percent of small dredging projects (depths less than 12 ft below MLLW). It is assumed that the federal government would cover 100 percent of the cost of dredging and aquatic disposal of that material. Other small dredging sponsors (such as marinas and homeowners associations) are assumed to pay 100 percent of the total costs for the remaining 40 percent of dredged material. This analysis assumes continued federal funding for dredging of shallow-draft recreational channels. It is important to note, however, that these projects do not have a high budgetary priority, so increases in costs, and potential decreases in available federal funding, may delay or preclude federal operations and maintenance on these channels. In that instance, local sponsors may have to

| *Assumption* | *Rationale* | *Potential Effect on Unit Costs (& Total Costs)* | *Comments* |
|---|---|---|---|
| Dredging volume held constant at 296.5 mcy (or 237.3 clean material) over 50-year period. | Allows for comparison of alternatives. | +/-<br>(+) | Dredge volumes will vary under different alternatives and over time. Estimate of 296.5 based on Gahagan & Bryant's high estimate of dredging volume. |
| Percentage of material disposed in each placement environment held constant over 50 years. | Allows for direct comparison and ease of calculation of total costs. | ne<br>(+) | Total costs likely lower as UWR projects are phased in over time. |
| Costs estimated for disposal of clean material only. | NUAD material requires special handling and disposal, and it is likely that the same amount of NUAD material would be dredged and disposed of under each alternative. | ne<br>(ne) | Overall costs of disposing NUAD material should not vary among the alternatives. |
| Costs presented in 1995 constant dollars, and are not discounted. | Existing information does not capture future variations in annual dredging and disposal activities. | ne<br>(ne) | Since costs are not assumed to vary in future years, discounting would not affect the relative difference among the alternatives. |
| Costs do not attempt to capture non-market (i.e., environmental) costs. | Other portions of the EIS/R will examine environmental effects of the alternatives. Monetizing environmental costs is extremely difficult and is beyond the scope required for a programmatic EIS/R. | -<br>(-) | Inclusion of environmental costs would raise the cost of all alternatives, though it may change the relative difference among the alternatives. |
| Costs do not incorporate market and non-market benefits associated with each alternative. | Other portions of the EIS/R will examine potential benefits. Monetizing environmental benefits is extremely difficult. | +<br>(+) | Inclusion of market and non-market benefits would lower the cost of all alternatives, though it may change the relative difference among the alternatives. |
| For the most part, costs do not reflect the costs of government regulation and management of dredging and dredged material disposal. | Difficult to estimate the direct government costs. | -<br>(-) | Inclusion of government costs would increase the costs of all alternatives. Administrative/ bureaucratic costs for UWR would likely be higher than for ocean or in-Bay disposal. |
| Estimates based on current regulatory and financial framework for dredging and dredged material disposal. | Cannot speculate about possible changes in policy. | +<br>(+) | Policy changes (e.g., cost mitigation for small dredgers or changes in cost-sharing) could reduce both unit costs for certain sectors and total costs. |
| Material from each work category is distributed among the placement environments according to the relative percentage of total material going to that environment (e.g., if 40 percent of all dredged material is slated for UWR, it is assumed that 40 percent of the material generated by | Allows for direct comparison and ease of calculation of total costs. Also, cannot speculate how specific disposal decisions would be made. | +<br>(+) | Likely that smaller dredging projects will not find it practical to send such a high percentage to higher-cost sites. |

The magnitude of regional effects potentially resulting from cost increases was evaluated by assessing the magnitude of dredging and disposal costs in relationship to total revenues generated by the maritime industry. As discussed in the Affected Environment for socioeconomics (section 4.6) and shown in Table 4.6-2 (Summary of Maritime Industry Economic Activity), the maritime industry generated an estimated $7.5 billion in revenues in the Bay Area in 1990. These revenues represented 4.1 percent of the Bay Area's estimated gross regional product in 1990.

Finally, this analysis does not attempt to quantify the environmental benefits or costs to the region associated with any of the alternatives. It also does not estimate potential costs attributable to the current uncertain regulatory climate (such as costs associated with delayed or avoided dredging), nor the effect of that uncertainty on the regional economy.

*General Effects Common to All Alternatives*

As shown in Table 6.2-7, total dredging and disposal costs for dredgers in the San Francisco Bay Area are estimated to increase under all alternatives compared to No-Action. Public and private entities directly dependent on dredging to sustain or expand their operations would react differently to changes in costs. The general effects on each of the three dredging sectors (federal government, major dredgers, and small dredgers) that would be common to all alternatives are described below.

In addition to the effects on each sector, implementation of any of the LTMS alternatives would improve regulatory certainty for all dredgers in the Bay Area. Establishing a comprehensive set of goals, policies, and guidelines for the implementation of projects would achieve the following:

- Streamline the process for obtaining required permits from the jurisdictional agencies involved in the approval process;
- Reduce delays caused by conflicting policies among the federal and state agencies that have authority over projects; and
- Reduce the time required to gain permit approvals, and therefore reduce the overall costs of projects for all types of sponsors.

Similarly, establishment of multi-user sites for disposal or reuse of NUAD-class material could reduce overall costs of this aspect of disposal, since individual dredgers would not have to bear on their own all the costs of site acquisition, development, and operations.

FEDERAL GOVERNMENT. Federal agencies that undertake and participate in new and maintenance dredging projects, including the COE and the U.S. Navy, receive funding through congressional budget allocations. Increased dredging and/or disposal costs would require increased budget allocations to offset direct dredging costs and cost-sharing responsibilities, assuming federal dredging and cost-sharing requirements remain unchanged in the future.

The ability and willingness of the federal government to provide funding to offset incrementally higher costs for new and maintenance dredging projects under the alternatives is unknown. For the purposes of this analysis, the federal government is assumed to continue funding its existing share of dredging/disposal costs (i.e., the same percentage of higher absolute costs would still be borne by the federal government). In this situation, no adverse regional economic effects would result from increased dredging/disposal costs to federal agencies. It is possible, however, that federal funding may not increase to meet the same percentage of higher dredging and disposal costs. Actual federal funding may remain fixed, or could even decrease. The current cost to the government is illustrated by the No-Action alternative. If actual federal *allocations* for dredging operations and maintenance (O&M) in the region remain fixed, a smaller *percentage* of the higher overall costs would be federally funded. In this case, it is readily apparent that another source of funds would be needed under any of the other alternatives to cover the increased costs. The COE may have to consider options such as maintaining only the highest priority navigation channels, balancing increased costs with decreases in funds to other projects or sectors, or looking to local sponsors to provide an increased percentage share of maintenance dredging operations. These shifts may not impact the region as a whole, but could affect those particular (e.g., private) sectors whose federal funds are effectively cut or whose cost-share percentage is effectively increased.

OTHER MAJOR DREDGERS. Other major dredgers include the ports and bulk shippers, such as oil companies. The reaction of ports in the San Francisco Bay Area to increased dredging/disposal costs are difficult to analyze because of the different cost/revenue structures faced by individual ports. The potential effects of increased dredging/disposal costs on ports can be examined by evaluating how dredging costs affect overall port costs and whether cost increases can be passed along to port customers. Costs faced by ports will only increase for that proportion of material that would not go to in-Bay disposal (primarily material from new work and some portion of material from maintenance dredging).

Dredging costs are a component of total port capital and operating expenditures. An increase in dredging costs would exert upward pressure on port vessel charges, cargo charges, lease and rental rates, and prices for other port services. Ports generally set prices to recover fixed and variable costs and provide for a rate of return adequate to cover debt service and to provide funds for reinvestment in port facilities and equipment (MARAD 1994). Assuming that federal cost-sharing policies do not change to offset cost increases, ports would presumably attempt to raise prices high enough to recapture additional dredging and disposal costs under the alternatives.

The ability of ports to pass along cost increases to customers is limited by competitive considerations and lease agreements. Cargo ports such as the Port of Oakland compete for business with ports in Long Beach, Los Angeles, Seattle, and Tacoma. Though future market conditions are difficult to predict, competitive considerations may limit the ability of Bay Area ports to completely or quickly pass along dredging cost increases to port users.

Terminal lease deals may also reduce the ability of some ports to quickly pass along cost increases to port users. Fixed-rate, long-term leases for shipping terminals may limit a port's ability to pass along increased dredging costs in the near term. Other types of lease agreements allow for varying levels of flexibility in setting annual rates over the lease term.

If ports are able to pass along much or all of the dredging/disposal cost increase along to their customers, few regional economic effects would occur under the project alternatives because ports would be generally able to maintain business volumes and employment levels. If ports are unable to pass along all or much of increased dredging/disposal costs to customers because of competitive pressures or lease arrangements, and assuming that cost-share policies do not change, operating income available to ports would be reduced. Ports operating on the financial margin or with net operating income deficits may be adversely affected by any increase in dredging/disposal costs that cannot be passed along to port customers. These ports may need to reduce operations or increase borrowing to finance existing operations. Reductions in port operations would reduce regional employment and revenue levels associated with port industries.

According to a recent study of port financing (MARAD 1994), the ports of Oakland and San Francisco had profits (before taxes and contributions), while the Port of Richmond had a net loss, during 1992. Port financial conditions and profitability change from year to year; however, increased dredging/disposal costs under the project alternatives would likely have adverse economic effects on some ports in the Bay Area.

Other major dredgers, such as oil companies or other bulk shippers, represent approximately 10 percent of total dredged material volume from major dredgers. Oil companies maintain marine facilities near processing plants to accommodate shipping petroleum products to various market areas. These companies would likely pass along increased dredging costs to petroleum products customers in the form of higher prices. Since dredging costs do not represent a large proportion of overall costs for oil companies, any price increase related to dredging costs would likely be very small.

SMALL DREDGERS. Small dredgers include all projects in the "small dredging" category. Federally authorized projects account for approximately 60 percent of dredged material volume from small dredging projects, and the remaining 40 percent is conducted primarily by public and private marinas, yacht clubs, and other small maritime businesses. This analysis assumes continued federal funding for dredging of shallow-draft recreational channels. These projects do not have a high budgetary priority, however, so increases in costs, and potential decreases in available federal funding, may delay or preclude federal operations and maintenance on these channels. In that instance, local sponsors may have to bear a greater proportion of the cost of continued maintenance.

Assuming that no cost mitigation policies are implemented, small dredgers such as private and public marinas, yacht clubs, and shipbuilding and repair companies would probably have difficulty reacting to large increases in dredging and disposal costs. Federal cost-sharing funds are not generally available for small projects, requiring project sponsors to absorb all of the cost increase associated with disposal to more-costly placement environments. In addition, small dredgers such as marinas do not have the borrowing capacity and cash flow of large ports.

The implications of increased costs for small dredgers are not obvious. Similar to ports, marinas would attempt to pass along costs to users through increased assessments, higher berthing fees, or fees for other services. Depending on the magnitude of the cost increase, fee increases needed to offset any additional costs may be high enough to discourage marina use, resulting in decreased use and revenues. Alternatively, the ability of marinas to absorb higher costs would depend on the specific financial health of individual marinas. This assumes, however, that no policies will be implemented to lessen the impact on these small dredgers (e.g., allowing priority use of less-expensive disposal sites). Shallow-draft recreational navigation channels have never been a high priority in COE budgetary requests due to the availability of funds.

*No-Action (Current Conditions)*

Under No-Action conditions, cumulative costs of dredging and disposal over the planning period are estimated to range from approximately $1.3 billion to $2.4 billion, which is an average of approximately $26 million to $47 million per year (Table 6.2-7). These costs would represent 0.3 to 0.6 percent of the overall $7.5 billion per year dredging-related maritime economy in the Bay Area (in 1990 dollars).

MAJOR DREDGERS. As Table 6.2-7 shows, the total costs of maintenance and new work projects undertaken by major dredgers are estimated to range from $1.1 billion to $1.9 billion over the planning period. The federal government is expected to absorb a large share of this cost based on the estimated cost distributions presented in Table 6.2-7. The simplified assumptions derived from current federal cost-sharing policies indicate that the federal government would absorb from 81 to 84 percent of these costs. Local, non-federal sponsors are estimated to face remaining costs, ranging from $173 million to $355 million over the planning period.

SMALL DREDGERS. Dredging and disposal costs for small dredging projects are estimated to total from $207 million to $504 million over the 50-year planning period (Table 6.2-7). Federally authorized projects for maintaining recreational channels in the Bay Area account for approximately 60 percent of this dredged volume, so federal expenditures are estimated to absorb $122 million to $298 million of these costs. Local, non-federal project sponsors would face costs estimated to range from $86 to $206 million over the planning period, or $1.7 million to $4.1 million annually (see Table 6.2-7). It is anticipated that federal maintenance of recreational channels will be substantially reduced if COE operations and maintenance funding is reduced by Congress. Such a change would dramatically increase costs for local, non-federal project sponsors.

*Alternative 1 — Emphasize Aquatic Disposal*

Under Alternative 1, costs were estimated based on the following assumed distribution of clean dredge material among placement environments: 40 percent in-Bay, 40 percent ocean, and 20 percent UWR. This alternative, which relies heavily on disposal at existing aquatic disposal sites, would likely be phased in more quickly than alternatives 2 and 3.

Cumulative costs of dredging and disposal over the planning period are estimated to range from approximately $1.6 billion to $2.7 billion under Alternative 1, which is an average of approximately $32 million to $54 million per year (Table 6.2-7). These costs are approximately $6 million to $7 million higher annually than cumulative costs estimated for No-Action conditions (an increase of approximately 15 to 21 percent). These costs would represent 0.4 to 0.7 percent of the overall $7.5 billion per year dredging-related maritime economy in the Bay Area (in 1990 dollars).

MAJOR DREDGERS. As Table 6.2-7 shows, the total costs of maintenance and new work projects undertaken by major dredgers under Alternative 1 are estimated to range from $1.35 billion to $2.16 billion over the planning period. The federal government is expected to absorb from 79 to 83 percent of these costs, similar to the percentage share under No-Action conditions. Local, non-federal sponsors would face remaining costs, estimated to range from $230 million to $461 million over the planning period, or $4.6 million to $9.2 million per year. These local sponsor costs would be approximately $58 million to $106 million higher than the $173 million to $355 million share under the No-Action conditions over the 50 years, or approximately $1.2 million to $2.1 million more per year (a 30 to 33 percent increase).

As discussed above for major dredgers under General Effects Common to All Alternatives (section 6.2.3.2), specific ports and other major dredgers would either pass along cost increases to customers or absorb all or part of the increase in costs. The $1.2 to 2.1 million annual cost increase estimated for local sponsors under Alternative 1 could result in both effects. However, it is likely that a transition to more costly alternatives would be phased in over time, reducing the overall costs to major dredgers and allowing them time to absorb any cost increases. In addition, increased costs may be offset by greater regulatory predictability. Therefore, the magnitude of the increase may not result in substantial adverse effects for major dredgers. Any adverse overall regional effects (i.e., reductions in regional employment because of reductions in the operations of major dredgers) resulting from cost increases under Alternative 1 would likely be small.

SMALL DREDGERS. Under Alternative 1, total dredging and disposal costs for small dredgers are estimated to range from $234 million to $539 million over the 50-year planning period (Table 6.2-7). Federally authorized projects for maintaining recreational channels in the Bay Area accounts for approximately 60 percent of this dredged volume, so federal expenditures are estimated to absorb $137 million to $318 million of these costs. Local, non-federal project sponsors would face costs estimated to range from $97 million to $222 million over the planning period (Table 6.2-7). These local costs are $11 million to $16 million higher than local costs estimated for No-Action conditions, or $230,000 to $310,000 per year (an increase of 8 to 13 percent).

The implications of increased costs for small dredgers are not obvious. Similar to ports, marinas and private boating clubs would attempt to pass along costs to users and members through higher berthing fees and fees for other services. The 8 to 13 percent increase in costs estimated for Alternative 1 might be low enough to be at least partially passed along to users. Other small dredgers, such as boat repair companies and utilities, would also likely pass some or all of the cost increase on to customers. Any adverse regional socioeconomic effects resulting from cost increases to small dredgers may be small under Alternative 1, but could be significant to individual entities.

*Alternative 2 — Emphasize In-Bay and Upland/Wetland Reuse*

Under Alternative 2, costs were estimated based on the following assumed distribution of clean dredge material among placement environments: 40 percent in-Bay, 20 percent ocean, and 40 percent UWR. Cumulative costs of dredging and disposal over the planning period are estimated to range from approximately $1.6 billion to $3.05 billion under Alternative 2, which is an average of approximately $33 million to $61 million per year (an increase of approximately 24 to 29 percent over No-Action conditions) (Table 6.2-7). These costs would represent 0.43 to 0.8 percent of the overall $7.5 billion per year dredging-related maritime economy in the Bay Area (in 1990 dollars).

Costs for Alternative 2 are approximately $39 million to $351 million more than Alternative 1, or $0.78 million to $7 million per year. Alternative 2 would likely be phased in much more slowly than Alternative 1 because of the time required to develop additional capacity at UWR disposal sites. The cost increase for this alternative would probably be lower than the estimates presented in tables 6.2-6 and 6.2-7 because these estimates were based on the assumption that the distribution of material assumed for this alternative would occur immediately. In reality, the shift from aquatic disposal sites to generally more-costly UWR disposal sites would occur over time, reducing costs in the initial phases of the 50-year planning period.

MAJOR DREDGERS. As Table 6.2-7 shows, the total costs of maintenance and new work projects undertaken by major dredgers under Alternative 2 are estimated to range from $1.4 billion to $2.5 billion over the planning period. The federal government is expected to absorb from 68 to 78 percent of these total costs, lower than the percentage share under No-Action conditions. Local, non-federal sponsors would face the remaining costs, estimated to range from $308 million to $796 million over the planning period. These local sponsor costs would be approximately $135 million to $441 million higher than the $172 million to $355 million attributed to local costs under the No-Action alternative over the 50-year period, or approximately $2.71 million to $8.8 million more per year (an increase of approximately 79 to 124 percent). Compared to Alternative 1, local sponsors would pay approximately $78 million to $335 million more over the 50 year period, or $1.5 million to $6.7 million per year (an increase of approximately 33 to 73 percent).

This increase in non-federal costs is due primarily to the increased disposal costs and site development and management costs accompanying the increase in UWR disposal. These costs are borne almost exclusively by local sponsors.

As discussed previously, most major dredgers would attempt to pass dredging/disposal cost increases along to customers. The $136 million to $441 million cost increase for local sponsors estimated for Alternative 2, however, is high enough that some major dredgers might not be able to immediately or fully pass all of the costs along to customers. Under highly competitive market conditions, higher customer prices charged by major dredgers such as ports could result in slower growth, operating deficits or, in the worst case, lost shipping business. Reduced port revenues could cause reductions in operations and employment and, subsequently, reductions in regional employment to some degree. It is unclear, however, to what degree those changes in employment would affect the regional economy. Of course, if the federal government paid a larger portion of the site development and maintenance costs, as in the Sonoma Baylands project, the cost to local sponsors would be less than estimated here.

SMALL DREDGERS. Under Alternative 2, total dredging and disposal costs for small dredgers are estimated to range from $228 million to $554 million over the 50-year planning period (Table 6.2-7). Federally authorized projects for maintaining recreational channels in the Bay Area account for approximately 60 percent of this dredged volume, so federal expenditures are estimated to absorb $131 million to $318 million of these costs. Local, non-federal project sponsors would face costs estimated to range from $97 million to $236 million over the planning period (Table 6.2-7). These local costs are $11 million to $30 million more than local costs estimated for No-Action conditions, or $223,000 to $591,000 per year (an increase of 13 to 14 percent). Costs for local sponsors for Alternative 2 would be approximately the same or only slightly more (6 percent) than Alternative 1.

As discussed previously, small dredgers would attempt to pass increased dredging/disposal costs along to marina users, private boating club members, and business customers. The $223,000 to $591,000 annual increase in costs over No-Action may or may not be enough to cause financial problems for many small dredgers. Small dredgers such as public and private marinas do not have the borrowing capacity and the ability to increase cash flow that many large ports have. Some small marinas and businesses that rely on maintenance dredging of harbors and access channels may reduce operations because of higher costs under Alternative 2. Without mitigation such as priority access to in-Bay disposal, homeowner associations that dredge may be the least able to bear these increases. Some loss of employment within the region could result from cost increases for small dredgers.

### *Alternative 3 — Emphasize Ocean and Upland/Wetland Reuse*

Under Alternative 3, costs were estimated based on the following assumed distribution of clean dredged material among placement environments: 20 percent in-Bay, 40 percent ocean, and 40 percent UWR. Dredging and disposal costs under Alternative 3 would be higher than under the other alternatives because of the increased use of more-costly ocean and UWR disposal sites. Cumulative costs of dredging and disposal over the planning period are estimated to range from approximately $1.8 billion to $3.2 billion under Alternative 3, which is an average of approximately $36 million to $65 million per year (Table 6.2-7). The costs associated with Alternative 3 would represent 0.5 to 0.9 percent of the overall $7.5 billion per year dredging-related maritime economy in the Bay Area (in 1990 dollars). These costs are approximately $10 million to $18 million per year higher than cumulative costs estimated for No-Action condition, an increase of approximately 38 percent.

Dredging and disposal costs for Alternative 3 are $220 to $545 million more than those under Alternative 1, and $181 to $194 million more than those under Alternative 2.

Similar to Alternative 2, Alternative 3 would likely be phased in much more slowly than Alternative 1 because of the time required to develop additional disposal capacity at UWR disposal sites. The cost increase for this alternative would probably be lower than the estimates presented in tables 6.2-6 and 6.2-7 because these estimates were based on the assumption that the distribution of material assumed for this alternative would occur immediately. In reality, the shift from aquatic disposal sites to generally more-costly UWR disposal sites would occur slowly, reducing costs in the initial phases of the 50-year planning period.

MAJOR DREDGERS. As Table 6.2-6 shows, the total costs of maintenance and new work projects undertaken by major dredgers under Alternative 3 are estimated to range from $1.6 billion to $2.7 billion over the planning period. The federal government is expected to absorb from 67 to 75 percent of these total costs, lower than the percentage share under No-Action conditions. Local, non-federal sponsors would face the remaining costs, estimated to range from $338 million to $833 million over the planning period. These local sponsor costs are approximately $165 million to $478 million higher than the local costs of $173 million to $355 million under No-Action conditions, or $3.3 million to $9.6 million more per year (an increase of 96 to 134 percent). Under Alternative 3, local sponsor costs for major dredgers would increase by $108 million to $372 million over the 50 years (47 to 81 percent) over Alternative 1, and $30 million to $36.8 million (5 to 10 percent) more than Alternative 2.

As discussed previously, most major dredgers would attempt to pass dredging/disposal cost increases along to customers. The approximately $9.6 million annual cost increase for local sponsors estimated for Alternative 3, however, is high enough that some major dredgers would probably not be able to immediately or fully pass all of the costs along to customers. Under highly competitive market conditions, higher customer prices charged by major dredgers such as ports could result in slower growth, operating deficits or, in the worst case, lost shipping business. Reduced port revenues could cause reductions in operations and employment and, subsequently, possible reductions in regional employment.

SMALL DREDGERS. Under Alternative 3, total dredging and disposal costs for small dredgers are estimated to range from $246 million to $576 million over the 50-year planning period (Table 6.2-6). Federally authorized projects for maintaining recreational channels in the Bay Area account for approximately 60 percent of this dredged volume, so federal expenditures are estimated to absorb $142 million to $331 million of these costs. Local sponsors would be responsible for the remaining $104 million to $245 million, or approximately $2 million to $5 million per year. Under Alternative 3, local sponsors would face costs that are $19 million to $38 million more than under No-Action conditions, or $373,000 to $769,000 more per year (an increase of 19 to 22 percent). Compared to Alternative 1, however, costs to local sponsors would increase by $7 million to $23 million, or $146,000 to $454,000 annually (approximately 7.5 to 10 percent). Under Alternative 3, local sponsor costs would be $7.5 million to $9 million more than under Alternative 2, or $150,000 to $178,000 more per year (an increase of 4 to 8 percent).

As discussed previously, small dredgers would attempt to pass increased dredging/disposal costs along to marina users, private boating club members, and business customers. The $373,000 to $769,000 annual increase in costs estimated for Alternative 3 over No-Action are likely high enough to cause financial problems for many small dredgers. Small dredgers such as public and private marinas do not have the borrowing capacity and the ability to increase cash flow that many large ports have. Some small marinas and businesses that rely on maintenance dredging of harbors and access channels may close or reduce operations because of higher costs under Alternative 3. Some loss of employment within the region could result from adverse cost effects on small dredgers.

### 6.2.4 Air Quality Assessment

The following is a presentation of air quality impacts that could occur from the four project dredging and disposal alternatives within the San Francisco Bay Area. Since the LTMS program includes a range of dredging and disposal possibilities, an exact description of air quality impacts associated with each project alternative cannot be provided at this time. The approach of the analysis is to present programmatic, yet reasonable impacts that could occur from each alternative that are based on the most current and expected dredging and disposal activities within the San Francisco Bay Area. Factors that could affect the emissions calculated for each alternative will be discussed. Definitive impacts for future projects will be performed on a site-specific EIS/EIR level at the time of final project definition.

#### 6.2.4.1 No-Action Alternative

The general assumption used in the analysis is that the annual dredging and disposal rate would be 4.74 mcy for each project alternative. This is the annual average volume calculated for the LTMS program 50-year planning period. The volume of sediments distributed to each placement environment would be the annual average of the volumes presented in Table 3 of the LTMS unit cost analysis (USEPA 1995). For the No-Action Alternative, these volumes are (1) 3.32 mcy for in-Bay disposal, (2) 0.71 mcy for ocean disposal, (3) 0.40 mcy for habitat restoration, and (4) 0.31 mcy for levee restoration.

Other than disposal volumes, the assumptions used to calculate disposal emissions at each of the placement sites for the No-Action Alternative analysis are the same as those used in the placement site analyses presented in section 6.1.5. Assumptions used to calculate dredging emissions include the following: (1) 0.95 mcy of sediment would be dredged by a 2,000-horsepower hopper dredge at a rate of 360 cy per hour and would be transported to an in-Bay placement environment; (2) the remaining 3.79 mcy of sediment would be dredged by two 5,000-horsepower clamshell dredges at a rate of 275 cy per hour and would be transported by barge and distributed to placement environments by the amounts mentioned in the previous paragraph; (3) each dredge would operate 22 hours per day until the above volumes are completed; and (4) for the calculation of peak daily emissions, disposal activities would not occur at more than one site per day. A presentation of equipment usage and emission calculations associated with the No-Action Alternative are contained in Appendix O.

Summaries of daily and total emissions that would occur from the No-Action Alternative are provided in tables 6.2-9 and 6.2-10, respectively. Peak daily emissions from the alternative would exceed the BAAQMD emission thresholds for ROG, NOx, and PM10. Peak daily emissions of TOG, ROG, PM, and $PM_{10}$ would occur during simultaneous dredging and disposal at the ocean location and peak daily emissions of all other pollutants would occur during simultaneous dredging and disposal at a levee restoration location. Additionally, with an annual CO emission rate of 223.1 tons, the alternative would trigger a conformity determination for this pollutant.

**Table 6.2-9. Daily Emissions Associated with Each LTMS Alternative**

| ***Alternative/Dredging or Disposal Site*** | **DAILY EMISSIONS (POUNDS)** | | | | | | |
|---|---|---|---|---|---|---|---|
| | ***TOG*** | ***ROG*** | ***CO*** | ***$NO_x$*** | ***$SO_2$*** | ***PM*** | ***$PM_{10}$*** |
| **No-Action Alternative** | | | | | | | |
| Dredging | 266 | 255 | 1,197 | 5,059 | 337 | 161 | 120 |
| Ocean | 302 | 290 | 470 | 2,704 | 189 | 218 | 209 |
| In-Bay | 121 | 117 | 171 | 1,021 | 72 | 74 | 69 |
| Habitat Restoration | 147 | 141 | 327 | 1,640 | 113 | 86 | 76 |
| Levee Restoration | 229 | 220 | 741 | 3,324 | 230 | 174 | 155 |
| Rehandling Facility | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| PEAK DAILY (a) | 568 | 545 | 1,938 | 8,383 | 566 | 379 | 329 |
| **Alternative 1** | | | | | | | |
| Dredging | 266 | 255 | 1,197 | 5,059 | 337 | 161 | 120 |
| Ocean | 302 | 290 | 470 | 2,704 | 189 | 218 | 209 |
| In-Bay | 121 | 117 | 171 | 1,021 | 72 | 74 | 69 |
| Habitat Restoration | 147 | 141 | 327 | 1,640 | 113 | 86 | 76 |
| Levee Restoration | 229 | 220 | 741 | 3,324 | 230 | 174 | 155 |
| Rehandling Facility | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| PEAK DAILY (a) | 568 | 545 | 1,938 | 8,383 | 566 | 379 | 329 |
| **Alternative 2** | | | | | | | |
| Dredging | 266 | 255 | 1,197 | 5,059 | 337 | 161 | 120 |
| Ocean | 302 | 290 | 470 | 2,704 | 189 | 218 | 209 |
| In-Bay | 121 | 117 | 171 | 1,021 | 72 | 74 | 69 |
| Habitat Restoration | 147 | 141 | 327 | 1,640 | 113 | 86 | 76 |
| Levee Restoration | 229 | 220 | 741 | 3,324 | 230 | 174 | 155 |
| Rehandling Facility | 288 | 277 | 700 | 2,823 | 196 | 191 | 175 |
| PEAK DAILY (a) | 568 | 545 | 1,938 | 8,383 | 566 | 379 | 329 |
| **Alternative 3** | | | | | | | |
| Dredging | 266 | 255 | 1,197 | 5,059 | 337 | 161 | 120 |
| Ocean | 302 | 290 | 470 | 2,704 | 189 | 218 | 209 |
| In-Bay | 26 | 25 | 19 | 160 | 12 | 5 | 3 |
| Habitat Restoration | 147 | 141 | 327 | 1,640 | 113 | 86 | 76 |
| Levee Restoration | 229 | 220 | 741 | 3,324 | 230 | 174 | 155 |
| Rehandling Facility | 288 | 277 | 700 | 2,823 | 196 | 191 | 175 |
| PEAK DAILY (a) | 568 | 545 | 1,938 | 8,383 | 566 | 379 | 329 |
| **BAAQMD Significance Criteria** | **NA** | **80** | **NA** | **80** | **NA** | **NA** | **80** |

*Note*: a. Transport and disposal for ocean, in-Bay, habitat restoration, levee, and landfill sites occur at only one site at a time. Peak daily CO, $NO_x$, and $SO_2$ emissions occur during dredging and transport and disposal to a levee site. Peak daily emissions of all other pollutants occur during dredging, transport, and disposal to an ocean site.

**Table 6.2-10. Total Emissions Associated with Each LTMS Alternative**

| ***Alternative/Dredging or Disposal Site*** | **TOTAL EMISSIONS (TONS)** | | | | | | |
|---|---|---|---|---|---|---|---|
| | ***TOG*** | ***ROG*** | ***CO*** | ***NO$_x$*** | ***SO$_2$*** | ***PM*** | ***PM$_{10}$*** |
| **No-Action Alternative** | | | | | | | |
| Dredging | 34.11 | 32.75 | 181.12 | 743.19 | 49.17 | 23.31 | 17.33 |
| Ocean | 9.64 | 9.25 | 15.02 | 86.36 | 6.03 | 6.96 | 6.68 |
| In-Bay | 7.94 | 7.62 | 10.85 | 65.72 | 4.63 | 4.62 | 4.32 |
| Habitat Restoration | 2.22 | 2.13 | 4.94 | 24.79 | 1.71 | 1.30 | 1.15 |
| Levee Restoration | 3.44 | 3.30 | 11.14 | 49.97 | 3.45 | 2.62 | 2.32 |
| Rehandling Facility | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| TOTAL | 57.35 | 55.06 | 223.08 | 970.03 | 64.98 | 38.81 | 31.81 |
| **Alternative 1** | | | | | | | |
| Dredging | 34.11 | 32.75 | 181.12 | 743.19 | 49.17 | 23.31 | 17.33 |
| Ocean | 25.75 | 24.75 | 40.20 | 231.11 | 16.13 | 18.62 | 17.87 |
| In-Bay | 4.40 | 4.23 | 5.25 | 33.87 | 2.41 | 2.07 | 1.87 |
| Habitat Restoration | 3.00 | 2.88 | 6.67 | 33.47 | 2.31 | 1.76 | 1.55 |
| Levee Restoration | 4.44 | 4.26 | 14.38 | 64.47 | 4.45 | 3.38 | 3.00 |
| Rehandling Facility | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| TOTAL | 71.74 | 68.87 | 247.62 | 1,106.10 | 74.46 | 49.14 | 41.63 |
| **Alternative 2** | | | | | | | |
| Dredging | 34.11 | 32.75 | 181.12 | 743.19 | 49.17 | 23.31 | 17.33 |
| Ocean | 12.89 | 12.38 | 20.10 | 115.55 | 8.06 | 9.31 | 8.94 |
| In-Bay | 4.40 | 4.23 | 5.25 | 33.87 | 2.41 | 2.07 | 1.87 |
| Habitat Restoration | 6.61 | 6.35 | 14.70 | 73.76 | 5.08 | 3.87 | 3.42 |
| Levee Restoration | 4.44 | 4.26 | 14.38 | 64.47 | 4.45 | 3.38 | 3.00 |
| Rehandling Facility | 5.16 | 4.95 | 14.59 | 42.00 | 2.85 | 3.79 | 3.56 |
| TOTAL | 67.62 | 64.92 | 250.14 | 1,072.84 | 72.02 | 45.73 | 38.12 |
| **Alternative 3** | | | | | | | |
| Dredging | 34.11 | 32.75 | 181.12 | 743.19 | 49.17 | 23.31 | 17.33 |
| Ocean | 25.79 | 24.75 | 40.20 | 231.11 | 16.13 | 18.62 | 17.87 |
| In-Bay | 2.04 | 1.96 | 1.51 | 12.56 | 0.93 | 0.36 | 0.23 |
| Habitat Restoration | 6.61 | 6.35 | 14.70 | 73.76 | 5.08 | 3.87 | 3.42 |
| Levee Restoration | 4.44 | 4.26 | 14.38 | 64.47 | 4.45 | 3.38 | 3.00 |
| Rehandling Facility | 5.16 | 4.95 | 14.59 | 42.00 | 2.85 | 3.79 | 3.56 |
| TOTAL | 78.15 | 75.02 | 266.49 | 1,167.08 | 78.60 | 53.33 | 45.41 |

The overwhelming majority of emissions from the No-Action Alternative would occur during dredging activities, as a result of the intense usage of the clamshell dredges, with their large, 5,000-horsepower rated engines. The placement environment with the largest contribution of disposal emissions for the alternative would be the ocean location, even though disposal volume at this location would be almost one-fifth the volume of the in-Bay site (0.71 versus 3.32 mcy). This is due to a much longer transport distance to the ocean site, which would produce substantial tug boat emissions. Tugboats are the main contributors to disposal emissions for this alternative.

Feasible measures to reduce significant emissions from the alternative would include (1) injection timing retard of diesel-powered equipment control for NO$_x$ control, and (2) use of reformulated diesel fuel to reduce ROG and SO$_2$ emissions, as described previously in section 6.1.5.2. Retarding injection timing by two degrees would reduce NO$_x$ emissions by about 15 percent from diesel-powered equipment. Use of reformulated fuel (ARB diesel fuel) would reduce ROG and SO$_2$ emissions by 15 and 64 percent, respectively, from diesel-powered equipment. Although electrification of diesel-powered dredges would eliminate a substantial amount of emissions from the alternative, this measure has been deemed infeasible, due to the high incidence of mechanical failures (USACE and Port of Oakland 1994). The most efficient way to minimize air quality impacts from the alternative would be to dispose of sediments at the placement environment nearest the dredging site. This would minimize the sediment transport distance and corresponding tug boat emissions, the largest contributor to disposal emissions. This effect is apparent in Table 6.1-6, which shows that in-Bay disposal generates the least amount of emissions per unit volume for any placement environment, largely due to having the shortest transport distance.

Emissions of $PM_{10}$ in the form of wind blown dust could occur if site preparation during habitat or levee restoration activities disturbs dry soils. However, implementation of the BAAQMD PM10 control measures would ensure that fugitive dust emissions remain insignificant. Handling and disposal of sediments would not produce any fugitive dust, due to a high water content. Sediments from levees that remain exposed to the atmosphere eventually would be covered with vegetation and would produce a minimal amount of fugitive dust.

Historical handling of dredged sediments in the San Francisco Bay region has generated only minimal odor complaints from the public, as identified in section 6.1.5.4. Disposal at a rehandling facility would represent the greatest potential for odor impacts of any placement environment. Since this activity is not proposed for the No-Action Alternative, odor impacts would be insignificant.

No-Action Alternative emissions would be spread over a large portion of the Bay Area, between the dredging sites and placement environments. This area would stretch from the ocean disposal site to the levee restoration location in the Delta subregion. Emissions would be most concentrated in the location of the clamshell dredges, since these sources would produce the largest amount of emissions for this disposal activity and they would be quasi-stationary. Site-specific analyses would be required to determine if emissions in proximity to the clamshell dredges would potentially exceed any ambient air quality standard. Since the remaining disposal emission sources would be mobile, pollutant impacts in a localized area from these sources would not be large enough to exceed any ambient air quality standard.

### 6.2.4.2 Alternative 1

The volume of sediments that would be distributed to each placement environment for the Alternative 1 analysis are (1) 1.90 mcy at in-Bay locations, (2) 1.90 mcy at ocean locations, (3) 0.54 mcy at habitat restoration locations, and (4) 0.40 mcy at levee restoration locations. Other than disposal volumes, the assumptions used to calculate dredging and disposal emissions for the analysis are the same as those used in sections 6.1.5 and 6.2.4.1. A presentation of equipment usage and emission calculations associated with Alternative 1 is contained in Appendix O.

Summaries of daily and total emissions that would occur from Alternative 1 are provided in tables 6.2-9 and 6.2-10, respectively. Peak daily emissions from the alternative would exceed the BAAQMD emission thresholds for ROG, NOx, and PM10. Peak daily emissions of TOG, ROG, PM, and $PM_{10}$ would occur during simultaneous dredging and disposal at the ocean location and peak daily emissions of all other pollutants would occur during simultaneous dredging and disposal at a levee restoration location. Additionally, with an annual CO emission rate of 247.6 tons, the alternative would trigger a conformity determination for this pollutant.

As with the No-Action Alternative, the overwhelming majority of emissions from Alternative 1 would occur during dredging activities, due to intense usage of the clamshell dredges. The placement environment with the largest contribution of disposal emissions for the alternative would be the ocean location. Even though the disposal volume at this location would be equal to the volume for in-Bay disposal, emissions for ocean disposal would be almost seven times higher compared to the in-Bay site. This is due to a much longer transport distance to the ocean site, which would produce substantial tug boat emissions. Tugboats are the main contributors to disposal emissions for the alternative.

Feasible measures to reduce significant emissions from the alternative would include (1) injection timing retard of diesel-powered equipment control for NOx control and (2) use of reformulated diesel fuel to reduce TOG/ROG and SO2 emissions. Retarding injection timing by two degrees would reduce NOx emissions by about 15 percent from diesel-powered equipment. Use of reformulated fuel (ARB diesel fuel) would reduce TOG/ROG and $SO_2$ emissions by 15 and 64 percent, respectively, from diesel-powered equipment. Although electrification of diesel-powered dredges would eliminate a substantial amount of emissions from the alternative, this measure has been deemed infeasible, due to the high incidence of mechanical failures (USACE and Port of Oakland 1994). The most efficient way to minimize air quality impacts from the alternative would be to dispose of sediments at the placement environment nearest the dredging site. This would minimize the sediment transport distance and corresponding tug boat emissions, the largest contributor to disposal emissions. This effect is apparent in Table 6.1-6, which shows that in-Bay disposal generates the least amount of emissions per unit volume for any placement environment, largely due to having the shortest sediment transport distance.

Emissions of $PM_{10}$ in the form of wind blown dust could occur if site preparation during habitat or levee restoration activities disturbs dry soils. However, implementation of the BAAQMD PM10 control measures would ensure that fugitive dust emissions remain insignificant. Handling and disposal of sediments would not produce any fugitive dust, due to a high water content. Sediments from levees that remain exposed to the atmosphere eventually would be covered with vegetation and would produce a minimal amount of fugitive dust.

Historical handling of dredged sediments in the San Francisco Bay region has generated only minimal odor complaints from the public, as identified in section 6.1.5.4. Disposal at a rehandling facility would represent the greatest potential for odor impacts of any placement environment. Since this activity is not proposed as part of this alternative, odor impact would be insignificant.

Alternative 1 emissions would be spread over a large portion of the Bay Area, between the dredging sites and placement environments. This area would stretch from the ocean disposal site to the levee restoration location in the Delta subregion. Emissions would be most concentrated in the location of the clamshell dredges, since these sources would produce the largest amount of emissions for this disposal activity and they would be quasi-stationary. Site-specific analyses would be required to determine if emissions in proximity to the clamshell dredges would potentially exceed any ambient air quality standard. Since the remaining disposal emission sources would be mobile, pollutant impacts in a localized area from these sources would not be large enough to exceed any ambient air quality standard.

### 6.2.4.3 Alternative 2

The volume of sediments that would be distributed to each placement environment for the Alternative 2 analysis are (1) 1.90 mcy for in-Bay disposal, (2) 0.95 mcy for ocean disposal, (3) 1.19 mcy for habitat restoration, (4) 0.40 mcy for levee restoration, and (5) 0.30 mcy for disposal at rehandling facilities. Other than disposal volumes, the assumptions used to calculate dredging and disposal emissions for the analysis are the same as those used in sections 6.1.5 and 6.2.4.1. A presentation of equipment usage and emission calculations associated with Alternative 2 is contained in Appendix O.

Summaries of daily and total emissions that would occur from Alternative 2 are provided in tables 6.2-9 and 6.2-10, respectively. Peak daily emissions from the alternative would exceed the BAAQMD emission thresholds for ROG, NOx, and PM10. Peak daily emissions of TOG, ROG, PM, and PM10 would occur during simultaneous dredging and disposal at the ocean location and peak daily emissions of all other pollutants would occur during simultaneous dredging and disposal at a levee restoration location. Additionally, with an annual CO emission rate of 250.1 tons, the alternative would trigger a conformity determination for this pollutant.

As with the No-Action Alternative and Alternative 2, the overwhelming majority of emissions from Alternative 2 would occur during dredging activities, due to intense usage of the clamshell dredges. The placement environment with the largest contribution of disposal emissions for the alternative would be the ocean location. Even though the disposal volume at this location would be one-half the volume for in-Bay disposal (0.95 versus 1.90 mcy), emissions for ocean disposal would be about four times higher compared to the in-Bay site. This is due to a much longer transport distance to the ocean site, which would produce substantial tug boat emissions. Tugboats are the main contributors to disposal emissions for the alternative.

Feasible measures to reduce significant emissions from the alternative would include (1) injection timing retard of diesel-powered equipment control for NOx control, and (2) use of reformulated diesel fuel to reduce TOG/ROG and SO2 emissions. Retarding injection timing by two degrees would reduce NOx emissions by about 15 percent from diesel-powered equipment. Use of reformulated fuel (ARB diesel fuel) would reduce TOG/ROG and SO2 emissions by 15 and 64 percent, respectively, from diesel-powered equipment. Although electrification of diesel-powered dredges would eliminate a substantial amount of emissions from the alternative, this measure has been deemed infeasible, due to the high incidence of mechanical failures (USACE and Port of Oakland 1994). The most efficient way to minimize air quality impacts from the alternative would be to dispose of sediments at the placement environment nearest the dredging site. This would minimize the sediment transport distance and corresponding tug boat emissions, the largest contributor to disposal emissions. This effect is apparent in Table 6.1-6, which shows that in-Bay disposal generates the least amount of emissions per unit volume for any placement environment, largely due to having the shortest sediment transport distance.

Emissions of $PM_{10}$ in the form of wind blown dust could occur if site preparation during habitat and levee restoration or rehandling activities disturbs dry soils. However, implementation of the BAAQMD PM10 control measures would ensure that fugitive dust emissions remain insignificant. Disposal of sediments would not produce any fugitive dust, due to a high water content. Sediments from levees that remain exposed to the atmosphere eventually would be covered with vegetation and would produce a minimal amount of fugitive dust. Dust emissions from rehandling facilities and landfill sites would occur if sediments become dry. However, these emissions could be adequately mitigated with the use of water sprays. Additionally, if sediments become dry enough to emit dust emissions, trucks could be covered and/or loads sprayed with water so that dust would not be generated during transport of the sediments to landfill sites.

Historical handling of dredged sediments in the San Francisco Bay region has generated only minimal odor complaints from the public, as identified in section 6.1.5.4. Disposal at a rehandling facility or landfill site would represent the greatest potential for odor impacts of any placement environment. Therefore, location of sensitive receptors in proximity to a rehandling facility or landfill site should be considered to ensure that impacts to this portion of the population remain insignificant. If odor impacts become an issue, this impact would be mitigated by decreasing the number of times the sediment would be turned by earth-moving equipment.

Alternative 2 emissions would be spread over a large portion of the Bay Area, between the dredging sites and placement environments. This area would stretch from the ocean disposal site to the levee restoration location in the Delta subregion. Emissions would be most concentrated in the location of the clamshell dredges, since these sources would produce the largest amount of emissions for this disposal activity and they would be quasi-stationary. Site-specific analyses would be required to determine if emissions in proximity to the clamshell dredges would potentially exceed any ambient air quality standard. Since the remaining disposal emission sources would be mobile, pollutant impacts in a localized area from these sources would not be large enough to exceed any ambient air quality standard.

### 6.2.4.4 Alternative 3

The volume of sediments that would be distributed to each placement environment for the Alternative 3 analysis are (1) 0.95 mcy for in-Bay disposal, (2) 1.90 mcy for ocean disposal, (3) 1.19 mcy for habitat restoration, (4) 0.40 mcy for levee restoration, and (5) 0.30 mcy for disposal at rehandling facilities. Other than disposal volumes, the assumptions used to calculate dredging and disposal emissions for the analysis are the same as those used in sections 6.1.5 and 6.2.4.1. A presentation of equipment usage and emission calculations associated with Alternative 3 is contained in Appendix O.

Summaries of daily and total emissions that would occur from Alternative 3 are provided in tables 6.2-9 and 6.2-10, respectively. Peak daily emissions from the alternative would exceed the BAAQMD emission thresholds for ROG, NOx, and PM10. Peak daily emissions of TOG, ROG, PM, and PM10 would occur during simultaneous dredging and disposal at the ocean location and peak daily emissions of all other pollutants would occur during simultaneous dredging and disposal at a levee restoration site. Additionally, with an annual CO emission rate of 266.5 tons, the alternative would trigger a conformity determination for this pollutant.

As with all the alternatives, the overwhelming majority of emissions from Alternative 3 would occur during dredging activities, due to intense usage of the clamshell dredges. The placement environment with the largest contribution of disposal emissions for the alternative would be the ocean location, due to the longest transport distance of any placement environment, which would result in substantial tug boat emissions. Tugboats are the main contributors to disposal emissions for the alternative.

Feasible measures to reduce significant emissions from the alternative would include (1) injection timing retard of diesel-powered equipment control for NOx control and (2) use of reformulated diesel fuel to reduce TOG/ROG and SO2 emissions. Retarding injection timing by two degrees would reduce $NO_x$ emissions by about 15 percent from diesel-powered equipment. Use of reformulated fuel (ARB diesel fuel) would reduce TOG/ROG and SO2 emissions by 15 and 64 percent, respectively, from diesel-powered equipment. Although electrification of diesel-powered dredges would eliminate a substantial amount of emissions from the alternative, this measure has been deemed infeasible, due to the high incidence of mechanical failures (USACE and Port of Oakland 1994). The most efficient way to minimize air quality impacts from the alternative would be to dispose of sediments at the placement environment nearest the dredging site. This would minimize the sediment transport distance and corresponding tug boat emissions, the largest contributor to disposal emissions. This effect is apparent in Table 6.1-6, which shows that in-Bay disposal generates the least amount of emissions per unit volume for any placement environment, largely due to having the shortest sediment transport distance.

Emissions of PM10 in the form of wind blown dust could occur if site preparation during habitat or levee restoration or rehandling activities disturbs dry soils. Disposal of sediments would not produce any fugitive dust, due to a high water content. Sediments from levees that remain exposed to the atmosphere eventually would be covered with vegetation and would produce a minimal amount of fugitive dust. Dust emissions from rehandling facilities and landfill sites would occur if sediments become dry. However, these emissions could be adequately mitigated with the use of water sprays. Additionally, if sediments become dry enough to emit dust emissions, trucks could be covered and/or loads sprayed with water so that dust would not be generated during transport of the sediments to landfill sites. Implementation of BAAQMD PM10 control measures would ensure that fugitive dust emissions remain insignificant.

Historical handling of dredged sediments in the San Francisco Bay region has generated only minimal odor complaints from the public, as identified in section 6.1.5.3. Disposal at a rehandling facility or landfill site would represent the greatest potential for odor impacts of any placement environment. Therefore, location of sensitive receptors in proximity to a rehandling facility or landfill site should be considered to ensure that impacts to this portion of the population remain insignificant. If odor impacts become an issue, this impact could be mitigated by decreasing the number of times the sediment would be turned by earth-moving equipment.

Alternative 3 emissions would be spread over a large portion of the Bay Area, between the dredging sites and placement environments. This area would stretch from the ocean disposal site to the levee restoration location in the Delta subregion. Emissions would be most concentrated in the location of the clamshell dredges, since these sources would produce the largest amount of emissions for this disposal activity and they would be quasi-stationary. Site-specific analyses would be required to determine if emissions in proximity to the clamshell dredges would potentially exceed any ambient air quality standard. Since the remaining disposal emission sources would be mobile, pollutant impacts in a localized area from these sources would not be large enough to exceed any ambient air quality standard.

#### 6.2.4.5 Comparison of Project Alternatives

Emissions estimated for each project alternative were based on simplified assumptions related to sediment volumes, dredging and disposal techniques, sediment transport distances, and associated equipment usage. Each alternative could ultimately be conducted somewhat differently than analyzed, resulting in a variation in the emissions presented. However, since the assumptions are based on typical and expected dredging and disposal activities within the San Francisco Bay region, the analysis represents a reasonable basis for a programmatic comparison among the alternatives.

Emissions generated from an alternative are ultimately dependent on the distribution of sediments to the various placement environments. Table 6.1-6 in section 6.1.5 identifies the level of emissions per unit volume of disposed sediment that would occur at each placement environment. The ranking of emissions at these locations, from the highest to lowest are (1) rehandling facility, (2) levee restoration, (3) ocean site, (4) habitat restoration, and (5) in-Bay site. Assuming that transport distance and resulting tug boat emissions to each placement environment would be equal, the ranking from highest to lowest would be (1) rehandling facility, (2) levee restoration, (3) habitat restoration, and (4/5) ocean and in-Bay (since disposal emissions would be minimal due to bottom-dumping scows).

Review of Table 6.2-10 shows that Alternative 3 would produce the highest emissions of all the alternatives, followed by Alternative 1, Alternative 2, then the No-Action Alternative. Subtracting dredging emissions, which is a constant for all of the alternatives, disposal emissions for Alternative 3 would be roughly double the disposal emissions that would occur from the No-Action Alternative (for example, 423.9 versus 226.8 tons of $NO_x$). The main reason for this difference is that 40 percent of the sediment proposed for disposal in Alternative 3 would occur at an ocean site, with a relatively high level of emissions per unit volume, and 70 percent of the sediment proposed for disposal in the No-Action Alternative would occur at an in-Bay site, which would produce roughly one-seventh the amount of emissions per unit volume compared to ocean disposal.

The following generalities can be derived from the analysis: (1) transport distance is the most important factor in determining the magnitude of disposal emissions; (2) subsequent tiers of sediment handling upon disposal at an initial placement environment creates additional emissions, compared to the simplest technique of bottom-dumping from barges, which produces essentially no disposal emissions; and (3) dredges produce the overwhelming majority of the total emissions from combined dredging and disposal activities. These findings are consistent with the results of analyses of recent site-specific dredging and disposal projects proposed in the San Francisco Bay region (USACE and Port of Oakland 1994; USACE and Port of Richmond 1995; and USACE and Contra Costa County 1995).

The air quality analysis identified measures that would mitigate project emissions, based on equipment modifications, the use of clean fuels, and implementation BAAQMD fugitive dust control measures. However, the most effective measure to minimize emissions from the LTMS program would be to dispose of sediments as close to the dredging site as possible, thereby minimizing transport distance and equipment usage from the largest contributor to disposal emissions, tug boats.

## 6.3 ADDITIONAL POLICIES IDENTIFIED AS NEEDED BASED ON EVALUATION OF POTENTIAL IMPACTS

The previous sections of this chapter have presented an evaluation of effects that are potentially associated with a range of alternative comprehensive management approaches for San Francisco Bay area dredged material. The potential impacts that are identified already take into account a variety of policy level, or programmatic, features or actions (the common "policy-level mitigation measures" described in Chapter 5) to minimize impacts and maximize benefits under each of the alternatives. However, based on the evaluation of impacts in this chapter, additional policy-level measures have been identified that would further reduce particular potential impacts, or increase potential benefits. The LTMS agencies therefore propose to adopt the following additional policies along with selection of any of the action alternatives.

### 6.3.1 Special Consideration for "Small Dredger" Projects

Section 6.2.3 above presented an evaluation of the potential socioeconomic impacts of the alternatives. That analysis represents a reasonable worst-case scenario of potential overall economic effects, in that (1) it did not directly take into account the value of regional environmental benefits associated with increased beneficial reuse of dredged material; (2) the economic estimates used were in several ways highly conservative and overstate likely economic impacts; and (3) the economic estimates assumed current regulatory practice and therefore do not reflect possible savings from regulatory streamlining efforts (see Appendix P). Nevertheless, the evaluation in section 6.2.3.2 clearly established that "small dredgers" as a group are relatively the most susceptible to potentially significant economic consequences under any of the action alternatives, unless policy-level measures are incorporated to mitigate this possibility. Therefore, the LTMS agencies propose to jointly adopt the following "small dredger" policy.

- *The LTMS agencies will give special consideration in the LTMS Management Plan to minimizing potential economic impacts to "small dredger" projects, for example, by reserving some of the available capacity at the least expensive disposal or reuse sites or by other means. The specific approach/policy for minimizing economic impacts to small dredgers will be established with public input as the LTMS Management Plan is developed, and will be incorporated as appropriate under the overall Management Plan in the specific Site Management and Monitoring Plan(s) for the in-Bay sites.*

On project-specific permit decisions, existing regulatory requirements, including the "practicability" test under the Clean Water Act Section 404(b)(1) Guidelines, would of course continue to apply.

### 6.3.2 Establishment of Additional Capacity for Rehandling and for Upland/Wetland Reuse or Disposal

None of the action alternatives can be fully implemented until additional multi-user capacity for rehandling of dredged material, and for upland/wetland reuse or disposal, can be made available. It is clear from the discussions and analyses presented in this EIS/EIR that the current lack of established capacity for these purposes is one of the most important constraints to achieving the LTMS goals. As discussed in section 6.2.2 above, the means for overcoming this constraint are largely beyond the direct control of the LTMS agencies, given their current authorities. However, the LTMS agencies recognize the great importance of establishing capacity for management of dredged material at other than unconfined aquatic disposal sites, and are committed to jointly using their authorities to the maximum extent possible both today, and under any new or revised authorities they may receive in the future. To this end, the following policy is proposed to be jointly adopted.

- *The LTMS agencies will establish or support, to the full extent of their authorities, sufficient capacity at rehandling facilities and at upland/wetland reuse or disposal sites to appropriately manage NUAD-class dredged material and to meet the dredged material placement distribution for SUAD-class dredged*

> *material established in the Policy EIS/ Programmatic EIR's preferred alternative.*

The LTMS Management Plan developed based on the selected alternative, and each of its subsequent revisions, will reflect the current status of the agencies' authorities and the measures the agencies can take at that time to work toward full implementation of the selected alternative.

## 6.4 SUMMARY OF THE PREFERRED ALTERNATIVE

The LTMS agencies have chosen Alternative 3 as the preferred alternative. Alternative 3 combines the highest level of upland/wetland reuse and the lowest level of in-Bay disposal of all the alternatives. It includes low disposal volumes at in-Bay sites, medium disposal volumes in the ocean, and medium volumes of upland/wetland reuse placement. This corresponds to long-term average targets of 20 percent disposal in the Bay, 40 percent disposal in the ocean, and 40 percent placement at upland/wetland reuse sites. This alternative combines the maximum environmental benefit of any of the alternatives with minimum risks to the Estuary and negligible risks to the ocean.

Overall, the LTMS agencies believe the preferred alternative has the best balance of environmental benefits and reduced risks to the Estuary. It will provide for reduced risk of impacts in the Bay because it will reduce the amount of dredged material that is disposed of in the Bay. In addition, it will provide for increased environmental benefits from increased upland/wetland reuse projects. This will primarily benefit water quality, fish and wildlife habitat, and special status species through habitat restoration projects. There may be some impacts/risks associated with this increase in UWR projects because some sensitive areas may not be avoided However, the LTMS agencies believe the benefits outweigh the risks. In addition, mitigation for some of these impacts is likely to be found during project-specific environmental analysis. Alternative 3 includes the policy-level mitigation measures discussed in chapters 5 and 6.

Please see sections 6.1 through 6.3 for a complete discussion and analysis of the comparison of alternatives.

### 6.4.1 Achieving the Preferred Alternative

Alternative 3 is a long-term approach that emphasizes beneficial use and ocean disposal of dredged material, with limited in-Bay disposal. The LTMS agencies believe Alternative 3 provides the best balance of the overall goals and objectives of the LTMS. It balances environmental benefits and impacts/risks, best reflects the national dredging policy, and is economically implementable over the long term. However, the management goal of emphasizing beneficial use and ocean disposal will need to be phased in over time. In particular, policy and management actions will need to be taken by respective agencies and upland/wetland reuse sites will need to be made available. The implementation section of this EIS/EIR discusses the measures that the LTMS agencies are considering to achieve the preferred placement emphasis. Section 6.5 below discusses how the LTMS agencies expect the transition to Alternative 3 to occur. The description of the transition to Alternative 3 presented in this document is conceptual. The implementation of the LTMS and the transition to Alternative 3 will occur through the LTMS Management Plan development process and only after extensive public input.

## 6.5 INITIAL IMPLEMENTATION OF ALTERNATIVE 3 — TRANSITION PERIOD

### 6.5.1 Overview

The LTMS agencies will not immediately be able to fully implement the 20/40/40 disposal distribution of suitable dredged material, as called for in Alternative 3. Instead, a multi-year transition period will be used to meet the goals of Alternative 3. This transition is intended to reduce economic dislocations to dredgers by allowing time for new disposal sites to be brought on line, to allow time for dredgers to prepare for new equipment and practices to be implemented, and to allow needed funding mechanisms and arrangements to be established. This also reflects the expectation that sufficient planning for new UWR projects takes time to ensure potential impacts and design issues are adequately addressed. This will enable UWR sites to be brought on line that will provide benefits rather than adverse impacts.

The transition framework is based on reasonable assumptions of the increasing availability of disposal sites over time and the feasibility of their use. For simplicity, a stepped decrease in disposal capacity at the in-Bay disposal sites over time will be used to help encourage the establishment of UWR sites, while ensuring that reduced in-Bay disposal will be implemented in a predictable manner, rather than potentially being delayed indefinitely. The overall transition period framework is discussed in the following sections. The LTMS Management Plan will provide further details of the policies and procedures for implementing the transition period.

### 6.5.2 Disposal Goals

Disposal goals for each of the three main disposal environments will be used to guide dredged material disposal during the early implementation of Alternative 3, as described in the following paragraphs.

#### *UWR Goal*

The goal of UWR disposal is simply to maximize the beneficial reuse of dredged material. However, significant UWR capacity may not be available, particularly in the early stages of the transition. Further, the analysis in this document shows that, at very high levels of UWR disposal, environmental impacts may decrease the desired benefits of UWR. Consequently the goals for the transition are to maximize UWR disposal up to the amount of permitted capacity at UWR sites, based on the assumption that permitted sites will have passed environmental review to ensure that their use will have overall benefits rather than unacceptable environmental impacts. The volume of future UWR capacity is not known at this time, but is expected to increase over the period of the transition. Of course, if significant UWR capacity becomes available relatively quickly (for example, the currently proposed Montezuma and Hamilton wetlands projects could accommodate approximately 25 mcy of reuse over the next 5-10 years), the 20/40/40 goal could be realized much sooner.

#### *Ocean Disposal Goal*

The goal for ocean disposal is to provide capacity for material that can be diverted from in-Bay disposal, when sufficient UWR capacity is not available or is not practicable. In essence, the SF-DODS acts as a “release valve” for steadily decreasing in-Bay disposal volumes. Originally (in 1994), the annual disposal limit at the SF-DODS was set at 6 mcy. This interim volume limit reflected the full amount of suitable (SUAD) dredged material expected to be generated from Bay area dredging on average, given the estimate at that time that an overall average of 8 mcy of dredging (SUAD plus NUAD material) would occur each year. Since that time, due primarily to military base closures in the area, LTMS has substantially lowered the long-term estimate of average annual dredging to a total of 6 mcy of SUAD plus NUAD material (Chapter 3). On this basis, in 1996 EPA revised the SF-DODS interim disposal volume limit to 4.8 mcy per year (80 percent of the total annual average of 6 mcy). Note that the SF-DODS disposal limit was not lowered due to any expectation of adverse impact at higher levels. The SF-DODS EIS (USEPA 1993a) determined that no significant adverse impacts were likely at the full 6 mcy per year, and annual site monitoring to date has indicated that the SF-DODS is performing as predicted in that EIS. Since the SF-DODS is intended to provide an alternative to in-Bay disposal when beneficial reuse is not available or practicable, and since adverse environmental impacts are not expected at the current disposal volume limit (or even at the higher volume of 6 mcy per year), the LTMS agencies recommend that EPA retain the current 4.8 mcy level as the permanent disposal volume limit for the site (also see section 6.5.6).

#### *In-Bay Disposal Goal*

The goal for in-Bay disposal is to reduce disposal to minimal volumes while still providing capacity for those dredging projects for whom ocean disposal and beneficial reuse are not practicable. This would most often be the case for “small dredgers,” but proponents of all projects must address practicability of alternatives to in-Bay disposal.

To move toward these goals, a volume for in-Bay disposal that decreases over time will be used to help move dredged material disposal practices toward full implementation of Alternative 3. The implementation of the in-Bay disposal volume limit will occur in two stages:

(1) Following the signing of the Record of Decision at the federal level and the certification of the document by the state lead agency, the federal agencies will immediately begin managing disposal at the three multi-user in-Bay sites based on an initial overall limit of 2.8 mcy per year. Disposal under this initial limit will be allocated through the DMMO on a first-come, first-served basis until the LTMS Management Plan is finalized (e.g., through adoption of San Francisco Bay Plan and Basin Plan amendments — actions that will involve the opportunity for extensive public involvement).

(2) After completion of the LTMS Management Plan and adoption of the Bay Plan and Basin Plan amendments, the overall in-Bay volume limits will be reduced periodically in the manner called for in the Management Plan. (For example, the LTMS agencies currently propose that during the transition period the overall in-Bay disposal limit would be reduced by 380,000 cy every third year, as described in following sections.)

The in-Bay disposal volume limit will initially be less ambitious than the long-term disposal goals, to take into account unexpected conditions and to ensure that the transition requirements are prudent and reasonable. However, even when the in-Bay limit would not be exceeded, each project must still evaluate and use alternative disposal options if feasible and practicable, consistent with the LTMS goals.

### 6.5.3 Assumptions Regarding Capacity

There is great interest and broad-based support for increasing UWR capacity throughout the San Francisco Bay region. This support is also reflected in national policies and initiatives. Several local large UWR projects are now in the planning and permitting stage. The Montezuma Wetlands Project (see Appendix E) proposes to accept approximately 17 to 20 mcy of dredged material for use on site. Additionally, the proposed Hamilton Wetlands Project, which encompasses the Hamilton Air Field, Antennae Field, and possibly the Bel Marin Keys Unit Five sites (Appendix E), could accept 8.7 mcy to over 30 mcy of dredged material depending upon the final site size and design. These sites both could become available by the year 2000. The Department of Water Resources also has extensive need for material to protect levees and increase habitat in the Sacramento-San Joaquin Delta (see Chapter 4, section 4.4.4.4). The LTMS agencies estimate that, combined, such projects could result in potential UWR capacity after the year 2000 sufficient to meet much, if not all, of the Bay dredging needs (let alone the LTMS goal for UWR) (Appendix M).

### 6.5.4 Transition Period Initial Disposal Limit

The starting point of the transition is based on the recent level of disposal. However, dredging needs vary from year to year, so an average estimated dredging volume is used to establish the starting volumes for the transition. The dredging volume estimate of 6 mcy per year that is used as a basis for the impact analysis in this EIS/EIR reflects high but reasonable estimates of the average new dredging plus maintenance dredging volumes. However, average dredging volumes over recent years have been lower than this estimate and some historic dredging projects — for example, closed military bases — will no longer contribute as much to dredging in the region. Consequently, use of the 6 mcy per year volume to set the starting point of the transition would have the effect of skewing the transition and delaying achievement of the LTMS goals for a longer period than necessary.

The LTMS agencies propose to use an overall in-Bay disposal volume limit of 2.8 mcy per year as the starting point for the transition period. As illustrated in Table 6.5-1, the average disposal volume for the years 1991 through 1997 was 2.3 mcy per year. (Note that disposal volume records from years before 1991 are less reliable and thus were not used. Similarly, since the LTMS agencies had already determined that large new work projects could not be accommodated at the existing in-Bay disposal sites, new work projects occurring during the 7-year period of record were not included in the calculation of the average disposal volume. Finally, projects that already utilize UWR disposal sites were not included in calculating the 2.3 mcy figure.)

Although the average annual maintenance dredging volume was 2.3 mcy, the maximum annual in-Bay maintenance dredging disposal volume that occurred over the same time period was 3.3 mcy. The proposed initial LTMS transition period limit of 2.8 mcy per year is the mean of the 2.3 mcy and the 3.3 mcy figures, and represents a reasonable starting point that should provide for the needs of the dredging community while alternative disposal options and infrastructures are developed. This initial transition period limit will be implemented beginning with the signing of the Record of Decision (ROD) for the EIS/EIR, as discussed in section 6.5.2. After the Bay and Basin plans are amended by the San Francisco Bay Conservation and Development Commission and the San Francisco Bay Regional Water Quality Control Board, respectively, the limit will be periodically further reduced.

The 2.8 mcy per year initial disposal volume limit will decrease *allowable* in-Bay disposal by just over 50 percent. However, this volume limit would still fully accommodate the average annual volume of maintenance material that has been dredged over the decade. Therefore, to the extent that practicable

Table 6.5-1 Total and Average Annual Maintenance Dredging Volumes (1991-1997)

(1 of 4)

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## Table 6.5-1. Total and Average Annual Maintenance Dredging Volumes (1991 - 1997)

Average annual maintenance dredging volumes. (Excluding sand dredging, new work, SF Bar Channel, and U.S. Navy projects.
Also excluding projects with dedicated upland disposal sites (e.g. San Leandro) and Delta projects (e.g. New York Slough). *

| Category ** | Disposa | Project | Project Depth (MLL W) | Year | Ref. | | Ref. | | Ref. | | Ref. | | Ref. | | Ref. | | Ref. | Total Volume dredged: 91-97 | Annual Average 91-97 (BCDC) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 1991 | | 1992 | | 1993 | | 1994 | | 1995 | | 1996 | | 1997 | | | |
| S | SF-11 | Aeolin YC | -9 | 13,454 | 1,2, | 0 | | 0 | | 0 | | 0 | | 0 | | 0 | | 13,454 | 1,922 |
| S | SF-11 | Allied | -5 | 0 | | 0 | | 0 | | 16,800 | 2 | 0 | | 0 | | 0 | | 16,800 | 2,400 |
| S | SF-11 | Ballena Bay | -5 | 527 | 1,2 | 0 | | 0 | | 0 | | 0 | | 0 | | 0 | | 527 | 75 |
| S | SF-11 | Belvedere Cove | -6 | 0 | | 0 | | 0 | | 0 | | 0 | | 10,503 | 4 | 0 | | 10,503 | 1,500 |
| S | SF-11 | Berkeley Marina | -12 | 111,987 | 1 | 12,182 | 1,2 | 32,169 | 2 | 0 | | 0 | | 0 | | 0 | | 156,338 | 22,334 |
| S | SF-10 | Black Point Launch Ramp | ? | 0 | | 0 | | 0 | | 0 | | 0 | | 200 | | 235 | 7 | 435 | 62 |
| S | SF-11 | Brickyard Cove | -10 | 0 | | 0 | | 0 | | 0 | | 0 | | 2,750 | 4 | 0 | | 2,750 | 393 |
| S | SF-11 | Candlestick Point | -8 | 0 | | 0 | | 0 | | 0 | | 0 | | 50,700 | | 0 | | 50,700 | 7,243 |
| S | SF-9 | City of Benecia Marina | -11 | 6,651 | 1 | 39,000 | 1,2 | 19,766 | 2 | 919 | 2 | 15,809 | 1,2 | 0 | | 16,090 | 7 | 98,235 | 14,034 |
| S | SF-11 | City of Corte Madera | ? | 0 | | 0 | | 29,000 | 2 | 0 | | 0 | | 0 | | 0 | | 29,000 | 4,143 |
| S | SF-11 | City of Emeryville | ? | 35,029 | 1 | 3,000 | 1 | 0 | | 0 | | 0 | | 0 | | 0 | | 38,029 | 5,433 |
| S | SF-9 | City of Vallejo Ferry Terminal | -12 | 0 | | 0 | | 8,000 | 2 | 0 | | 0 | | 0 | | 8,305 | 7 | 16,305 | 2,329 |
| S | SF-11 | Clipper YC | -8 | 0 | | 0 | | 0 | | 9,880 | 3 | 800 | 2,3 | 34,730 | 4 | 0 | | 45,410 | 6,487 |
| S | SF-11 | Contra Costa Flood Dist | ? | 0 | | 0 | | 0 | | 4,800 | 2 | 0 | | 0 | | 0 | | 4,800 | 686 |
| S | SF-11 | Corinthian Yacht Harbor | -5 | 0 | | 2,100 | 1 | 0 | | 0 | | 0 | | 0 | | 7,825 | 7 | 9,925 | 1,418 |
| S | SF-11 | Coyote Pt Marina | -12 | 0 | | 0 | | 0 | | 118,500 | 2 | 250 | 2,3 | 0 | | 0 | | 118,750 | 16,964 |
| S | SF-11 | Emery Cove | -9 | 40,273 | 1 | 0 | | 0 | | 0 | | 0 | | 55,175 | 4 | 0 | | 95,448 | 13,635 |
| S | SF-9 | Glen Cove Marina | -10 | 0 | | 0 | | 0 | | 0 | | 0 | | 2,600 | | 13,990 | 7 | 16,590 | 2,370 |
| S | SF-11 | Greenbrae Marina (City of | -10 | 0 | | 0 | | 0 | | 75,000 | 2,3 | 0 | | 0 | | 0 | | 75,000 | 10,714 |
| S | SF-10 | Greenbrae Marina (City of | -10 | 0 | | 0 | | 0 | | 0 | | 13,920 | 2 | 0 | | 0 | | 13,920 | 1,989 |
| S | SF-11 | Karl Limbach | ? | 0 | | 792 | 1 | 0 | | 0 | | 0 | | 0 | | 0 | | 792 | 113 |
| S | SF-10 | Loch Lomand Marina | ? | 0 | | 0 | | 0 | | 0 | | 0 | | 0 | | 32,570 | 7 | 32,570 | 4,653 |

### Table 6.5-1. Total and Average Annual Maintenance Dredging Volumes (1991 - 1997)

| Average annual maintenance dredging volumes. (Excluding sand dredging, new work, SF Bar Channel, and U.S. Navy projects. | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Also excluding projects with dedicated upland disposal sites (e.g. San Leandro) and Delta projects (e.g. New York Slough). * | | | | | | | | | | | | | | | | | | |
| Category ** | Disposa | Project | Project Depth (MLLW) | Year | Ref. | | Ref. | | Ref. | | Ref. | | Ref. | | Ref. | | Ref. | Total Volume dredged: 91-97 | Annual Average 91-97 (BCDC) |
| | | | | 1991 | | 1992 | | 1993 | | 1994 | | 1995 | | 1996 | | 1997 | | | |
| S | SF-11 | Marin Rowing Ass. | -5 | 0 | | 3,342 | 1 | 0 | | 0 | | 0 | | 0 | | 0 | | 3,342 | 477 |
| S | SF-10 | Marin YC | -8 | 3,700 | 2 | 0 | | 42,000 | 2 | 1,000 | 2 | 0 | | 0 | | 3,475 | 7 | 50,175 | 7,168 |
| S | SF-11 | Marinship Yacht Harbor | ? | 0 | | 200 | 1 | 0 | | 0 | | 0 | | 0 | | 0 | | 200 | 29 |
| S | SF-11 | McNear Pier | ? | 0 | | 0 | | 0 | | 0 | | 32,800 | 2,3 | 0 | | 0 | | 32,800 | 4,686 |
| S | SF-11 | Paradise Cay | <-8 | 40,691 | 2 | 0 | | 0 | | 0 | | 16,175 | 2 | 800 | 4 | 11,700 | 7 | 69,366 | 9,909 |
| S | SF-10 | Pt. San Pablo Yacht Harbor | -8 | 15,155 | 1 | 0 | | 0 | | 0 | | 0 | | 0 | | 0 | | 15,155 | 2,165 |
| S | SF-11 | Pullman Building | -10 | 41,518 | 1,2 | 14,312 | 1 | 0 | | 0 | | 0 | | 0 | | 0 | | 55,830 | 7,976 |
| S | SF-11 | Redrock Marina | ? | 0 | | 14,950 | 1 | 0 | | 0 | | 0 | | 0 | | 0 | | 14,950 | 2,136 |
| S | SF-11 | Redwood City YC | ? | 0 | | 0 | | 54,000 | 2 | 15,000 | 2 | 0 | | 0 | | 0 | | 69,000 | 9,857 |
| S | SF-11 | San Leandro Marina | -7 | 0 | | 0 | | 0 | | 0 | | 0 | | 0 | | 60,150 | 7 | 60,150 | 8,593 |
| S | SF-10 | San Rafael Canal | -8 | 0 | | 0 | | 0 | | 0 | | 122,507 | 2,3,4 | 35,700 | 4 | 28,750 | 7 | 186,957 | 26,708 |
| S | SF-11 | San Rafael Canal | -6 | 0 | | 0 | | 0 | | 0 | | 0 | | 0 | | 750 | 7 | 750 | 107 |
| S | SF-9 | San Rafael Yacht Club | ? | 2445 | 1 | 12,310 | 1 | 920 | 2 | 0 | | 1,900 | 2,3 | 0 | | 0 | | 17,575 | 2,511 |
| S | SF-11 | Sausalito Marine Corp | -8 | 0 | | 1,400 | 1 | 0 | | 0 | | 0 | | 0 | | 0 | | 1,400 | 200 |
| S | SF-11 | Sausalito Yacht Club | -13 | 160 | 1,2 | 0 | | 0 | | 0 | | 0 | | 0 | | 0 | | 160 | 23 |
| S | SF-11 | SF Marina | -12 | 0 | | 0 | | 0 | | 11,544 | 3 | 0 | | 22,863 | 4 | 0 | | 34,407 | 4,915 |
| S | SF-11 | St. Francis YC (Belvedere) | -11 | 0 | | 16,299 | 1 | 0 | | 1,544 | coe | 4,775 | 2,3 | 0 | 4 | 0 | | 22,618 | 3,231 |
| S | SF-11 | Strawberry Rec Dist | -6 | 0 | | 137,000 | 1,2 | 81,136 | 2 | 0 | | 0 | | 45,675 | 4 | 0 | | 263,811 | 37,687 |
| S | SF-10 | Vallejo Yacht Club | -9 | 0 | | 0 | | 0 | | 0 | | 0 | | 0 | | 1,500 | 7 | 1,500 | 214 |
| S | SF-11 | W.B. Clausen | ? | 0 | | 820 | 1 | 0 | | 0 | | 0 | | 0 | | 0 | | 820 | 117 |
| S | SF-11 | Wickland Oil | ? | 0 | | 0 | | 0 | | 0 | | 0 | | 3,604 | 4 | 0 | | 3,604 | 515 |

**Table 6.5-1. Total and Average Annual Maintenance Dredging Volumes (1991 - 1997)**

| Average annual maintenance dredging volumes. (Excluding sand dredging, new work, SF Bar Channel, and U.S. Navy projects. | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Also excluding projects with dedicated upland disposal sites (e.g. San Leandro) and Delta projects (e.g. New York Slough). * | | | | | | | | | | | | | | | | | | | |
| Category ** | Disposa | Project | Project Depth (MLLW) | Year | Ref. | | Ref. | | Ref. | | Ref. | | Ref. | | Ref. | | Ref. | Total Volume dredged: 91-97 | Annual Average 91-97 (BCDC) |
| | | | | 1991 | | 1992 | | 1993 | | 1994 | | 1995 | | 1996 | | 1997 | | | |
| | | | | | | | | | | | | | | | | | | | |
| ***TOTAL*** | | | | *311,590* | | *257,707* | | *266,991* | | *254,987* | | *208,936* | | *265,300* | | *185,340* | | *1,750,851* | *250,122* |
| | | | | | | | | | | | | | | | | | | | |
| M | SF-11 | ARCO | -35 | 35,000 | 1,2 | 0 | | 0 | | 0 | | 0 | | 0 | | 0 | | 35,000 | 5,000 |
| M | SF-9 | Benecia Port Terminal | -39 | 27,600 | 1,2 | 45,000 | 2 | 28,000 | 2 | 25,771 | 2,6 | 0 | | 72,335 | 4 | 2,149 | 7 | 200,855 | 28,694 |
| M | SF-11 | Chevron (Richmond Long Wharf) | -45 | 284,800 | 1,2 | 0 | | 261,110 | 2 | 0 | | 141,634 | 2,4 | 156,802 | 4 | 283,030 | 7 | 1,127,376 | 161,054 |
| M | SF-10 | City of Larkspur | ? | 20,285 | 3 | 0 | | 0 | | 0 | | 13,920 | 3 | 0 | | 0 | | 34,205 | 4,886 |
| M | SF-9 | Exxon (Benecia) | -35 | 19,500 | 1,2 | 40,000 | 1,2 | 11,700 | 2 | 7,597 | 2,6 | 12,200 | 2,3 | 61,086 | 4 | 19,000 | 7 | 171,083 | 24,440 |
| M | SF-11 | Larkspur Ferry Terminal | -15 | 0 | | 0 | | 217,200 | 2 | 0 | | 466,937 | 2,3 | 0 | | 20,905 | 7 | 705,042 | 100,720 |
| M | SF-11 | PG&E | -16 | 31,200 | | 16,000 | | 0 | | 0 | | 0 | | 0 | | 0 | | 47,200 | 6,743 |
| M | SF-9 | Pacific Refining Co. | -38 | 102,906 | 1 | 0 | | 0 | | 0 | | 0 | | 0 | | 0 | | 102,906 | 14,701 |
| M | SF-11 | Port of Oakland | -42 | 302,586 | 1 | 156,000 | 2 | 328,806 | 2 | 126,490 | 6 | 42,335 | 2 | 178,272 | 2,4 | 176,200 | 7 | 1,310,689 | 187,241 |
| M | SF-11 | Port of Richmond | -38 | 8,446 | 1,2 | 0 | | 0 | | 28,500 | 2 | 124,600 | 2 | 0 | | 0 | | 161,546 | 23,078 |
| M | SF-11 | Port of SF (Berths & Fisherman's | -40 | 60,343 | 1 | 51,000 | 1,2 | 30,000 | 2 | 26,000 | 2,6 | 45,079 | 2,3, 4 | 140,832 | | 0 | | 353,254 | 50,465 |
| M | SF-11 | San Rafael Rock Quarry | -16 | 33,300 | 2 | 0 | | 0 | | 0 | | 0 | | 0 | | 0 | | 33,300 | 4,757 |
| M | SF-11 | SF Drydock (SW Marine) | -35 | 0 | | 89,000 | 1,2 | 0 | | 0 | | 119,000 | 2,3 | 0 | | 0 | | 208,000 | 29,714 |
| M | SF-11 | Schnitzer Steel | -37 | 0 | | 0 | | 13,440 | 2 | 0 | | 0 | | 15,811 | 4 | 7,284 | 7 | 36,535 | 5,219 |
| M | SF-9 | Unocal/Tosco | -35 | 55,600 | | 0 | | 50,655 | | 0 | | 0 | | 89,556 | | 26,300 | 7 | 222,111 | 31,730 |
| M | SF-11 | USCG (Horseshoe Cove & YB Is.) | -18 | 0 | | 0 | | 0 | | 55,000 | 2 | 0 | | 0 | | 0 | | 55,000 | 7,857 |

## Table 6.5-1. Total and Average Annual Maintenance Dredging Volumes (1991 - 1997)

Average annual maintenance dredging volumes. (Excluding sand dredging, new work, SF Bar Channel, and U.S. Navy projects.

Also excluding projects with dedicated upland disposal sites (e.g. San Leandro) and Delta projects (e.g. New York Slough). *

| Category ** | Disposa | Project | Project Depth (MLL W) | Year | Ref. | | Ref. | | Ref. | | Ref. | | Ref. | | Ref. | | Ref. | Total Volume dredged: 91-97 | Annual Average 91-97 (BCDC) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 1991 | | 1992 | | 1993 | | 1994 | | 1995 | | 1996 | | 1997 | | | |
| ***Total*** | | | | *981,566* | | *397,000* | | *940,911* | | *214,358* | | *965,705* | | *485,557* | | *249,689* | | *4,804,102* | *604,969* |
| | SF-9 | Mare Is Strait | -36 | 154,242 | 1,2 | 304,838 | 1,2 | 976,415 | 2 | ####### | 2 | 0 | | 0 | | 0 | | 2,635,495 | 376,499 |
| COI | SF-10/Son Baylan | Petaluma ATF | -8 | 0 | | 115,000 | 2,3 | 0 | | 340,460 | 2,3 | 0 | | 200 | 4 | 0 | | 455,660 | 65,094 |
| COI | SF-10 | Pinole Shoal | -45 | 88,885 | 1 | 0 | | 55,213 | 2 | 0 | | 373,829 | 2,4 | 0 | | 256,846 | 7 | 774,773 | 110,682 |
| COI | SF-11 | Oakland Harbor | -42 | 98,904 | 1,2 | 231,922 | 1,2 | 267,185 | 1,2 | 154,206 | Port of | 118,350 | 3,4 | 69,334 | | 213,982 | 7 | 1,153,883 | 164,840 |
| COI | SF-11 | Richmond Harbor | 38 to 45 | 475,500 | 1 | 379,000 | 2 | 353,214 | 1 | 300,000 | 2 | 476,532 | 4 | 491,850 | 4 | 346,024 | 7 | 2,822,120 | 403,160 |
| COI | SF-11 | Redwood City Harbor | -30 | 0 | | 251,000 | 1,2 | 399,544 | 2 | 0 | | 0 | | 965,998 | 4 | 0 | | 1,616,542 | 230,935 |
| COI | SF-11 | San Rafael ATF | -6 | 0 | | 9,500 | 2 | 0 | | 0 | | 0 | | 0 | | 191,829 | 7 | 201,329 | 28,761 |
| COI | SF-11 | San Rafael Creek | -6 | 0 | | 15,000 | 2 | 0 | | 0 | | 0 | | 0 | | 0 | | 15,000 | 2,143 |
| COI | Suisun Bay/Jersey Is. | Suisun Bay Channel | -35 | 88,885 | 2 | 32,900 | 2 | 32,900 | 2 | 66,321 | 2 | 37,206 | 2,4 | 284,981 | 4 | 0 | | 543,193 | 77,599 |
| ***Total*** | | | | *906,416* | | *#######* | | *#######* | | *#######* | | *#######* | | *#######* | | *#######* | | *########* | *1,459,714* |
| **TOTAL** | | | | ###### | | ####### | | ####### | | ####### | | ####### | | ####### | | ####### | | ######## | 2,314,805 |
| | | (old totals) | | ###### | | ####### | | ####### | | ####### | | ####### | | | | | | | |
| | | (Total - Old Total) | | 415,635 | | -2,762 | | 1,770 | | -64,676 | | 13,660 | | | | | | | |

** "S" = project depth < -12', > 50,000 cy/yr, non-COE project, "M" = not small and non-COE projects, "COE" = all Corps-maintained projects.

<< When more than one value was available, the higher volume was used>>

References cited below: (1) USACOE, S.F. Bay Dredging Records, 1985-1993.; (2) SFRWQCB & BPC, S.F. Bay Dredging Volumes, 1991-1995.;

(3) USACOE, Annual Report and 4th Quarter Summary, FY 1995.; (4) USACOE, Annual Report and 4th Qrtr. Summary, FY 1996.;

(5) Moffatt & Nichol Engineers, 1997, Inventory of S.F. Bay Area Dredging Projects.

### Table 6.5-1. Total and Average Annual Maintenance Dredging Volumes (1991 - 1997)

| | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Average annual maintenance dredging volumes. (Excluding sand dredging, new work, SF Bar Channel, and U.S. Navy projects. | | | | | | | | | | | | | | | | | | | |
| Also excluding projects with dedicated upland disposal sites (e.g. San Leandro) and Delta projects (e.g. New York Slough). * | | | | | | | | | | | | | | | | | | | |
| Category ** | Disposa | Project | Project Depth (MLLW) | Year | Ref. | | Ref. | | Ref. | | Ref. | | Ref. | | Ref. | | Ref. | Total Volume dredged: 91-97 | Annual Average 91-97 (BCDC) |
| | | | | 1991 | | 1992 | | 1993 | | 1994 | | 1995 | | 1996 | | 1997 | | | |
| (6) BCDC & USACOE, 4/7/95, Dredging and Disposal Roadmap. (7) USACOE, Annual Report and 4th Qrtr. Summary, FY 1997. | | | | | | | | | | | | | | | | | | | |

disposal alternatives are not available right away, significant changes in disposal practices may not immediately occur. In-Bay limits will slowly decrease as described below (section 6.5.6), allowing dredgers time to phase-in to the implemented alternative while ensuring that a long-term reduction of in-Bay disposal will, in fact, occur.

### 6.5.5 Decreasing the in-Bay Disposal Limit

The Alternative 3 long-term disposal goal is 20 percent to in-Bay disposal sites, 40 percent to the SF-DODS, and the remaining 40 percent to UWR sites. This distribution would result, on average, in the placement of approximately 1 mcy per year at the in-Bay disposal sites, and approximately 2 mcy per year at UWR sites and at the SF-DODS. In the event that other efforts to meet the long-term LTMS goals are not successful in providing viable alternatives to in-Bay disposal, the transition period volume limits will define the maximum in-Bay disposal that will occur.

During the transition period, the LTMS agencies proposed to reduce the in-Bay disposal volume limit every third year by 380,000 cy. This rate of reduction level is intended to be neither too precipitous, nor too slow to provide an incentive to seek alternatives to in-Bay disposal. Dredgers should be able to plan for and implement alternatives to in-Bay disposal before the lowering in-Bay limits significantly constrain routine operations. The agencies will review progress toward the Alternative 3 goal and consider changes needed to LTMS policies every 6 years. This will allow the transition to be adjusted, as needed, based on changing conditions in the region, such as changes in overall dredging needs and regional and national policies.

The “endpoint” for this process will be reached when the overall volume limit is reduced to 1.25 mcy per year (this is slightly higher than the actual long-term goal of 1 mcy per year, to account for the inherent variability in dredging operations and needs). This final disposal volume limit would be reached approximately 10 years after the start of the transition period (Figure 6.5-1), if other efforts to increase UWR capacity do not reduce in-Bay disposal even sooner.

### 6.5.6 UWR and Ocean Disposal During the Transition Period

The date by which adequate capacity will be available in the UWR environment to accommodate the long-term LTMS goal of approximately 2 mcy per year cannot be determined, since the availability of UWR sites is unpredictable. However, during the time that is required for UWR sites to become available, ocean disposal at SF-DODS is expected to provide the “relief valve” between the slow mandatory reduction of in-Bay disposal and an increase in placement at UWR sites. To provide this relief, the permanent SF-DODS volume limit should be set at its present interim limit of 4.8 mcy per year. This volume was established because it is estimated to be sufficient to accommodate all suitable dredged material in an average year from the region, if necessary. Therefore, even if no UWR sites were available during the transition period, the ocean site disposal limit combined with the remaining allowable in-Bay disposal volume would exceed the overall 6 mcy annual dredging volume that is the basis for the LTMS planning goals. (Also see section 6.5.2.)

### 6.5.7 Potential Strategies for Implementing Alternative 3

The general framework for the transition to Alternative 3 is described above in sections 6.5.5 and 6.5.6. This section presents a range of options for how the LTMS agencies could manage the allocation of the allowable in-Bay disposal volume, which will be steadily decreasing over time until the long-term LTMS goals (20 percent in-Bay, 40 percent ocean disposal, 40 percent UWR) are effectively met. The LTMS agencies are soliciting comments on these options, which will be further evaluated via the LTMS Management Plan development process. Development of the LTMS Management Plan, as well as amendments to the Bay and Basin plans, will include significant opportunity for additional public comment on these allocation options.

As explained in sections 6.5.4 and 6.5.5, implementation of Alternative 3 will include an initial in-Bay disposal volume limit of 2.8 mcy per year. This in-Bay disposal volume limit will then decrease in increments of 380,000 cy every third year (see Figure 6.5-1). At any time during the transition period, the allowable in-Bay disposal volume must be allocated in some way among the three multi-user disposal sites, and among dredging project proponents. Also, some provision for emergencies and other unforeseen circumstances (a “contingency” volume) should be established. Finally, the issue of disposal site monitoring fees should be addressed. The following paragraphs discuss these issues, which would be common to all the allocation strategy options presented in the remainder of this chapter.

Figure 6.5-1 Proposed In-Bay Disposal Volume Limits Over Time — Alternative 3

### *Allocation Among Disposal Sites*

Initially, the LTMS agencies will divide the 2.8 mcy overall in-Bay disposal volume limit among the three multi-user in-Bay sites, in approximate proportion to their existing relative volume limits. Therefore, the Alcatraz site, which currently accommodates about 60 percent of all in-Bay disposal, could receive up to 1.65 mcy per year. Similarly, the San Pablo Bay site could receive up to 300,000 cy per year (about 10 percent), and the Carquinez site could receive up to 850,000 cy per year (about 30 percent). These initial allocations among the existing in-Bay sites may be changed based on public comment and further evaluation, during the LTMS Management Plan development process and the Bay Plan and Basin Plan amendment processes.

### *Allocation Among Dredging Project Proponents*

During the initial stages of the transition period (prior to finalization of the LTMS Management Plan and the Basin Plan and Bay Plan amendments), the LTMS agencies will generally allocate available disposal volume at each in-Bay disposal site on a first-come, first-served basis. This approach will be modified, however, according to the three dredger types: “small dredgers,” “medium dredgers” (medium dredgers are defined for the purposes of this section as those projects that are not COE maintenance dredging or small dredger projects), and COE maintenance dredging. Specifically, “small dredgers” as defined in this document will generally be exempt from the transition period’s specific volume limitations, as described below. Subsequently, based on public comment and further evaluation during the LTMS Management Plan development process and the Bay Plan and Basin Plan amendment processes, a different approach to allocation among the “medium dredgers” and the COE may be adopted.

### *Set-Aside for “Small Dredger” Projects*

“Small dredgers” are defined by LTMS as having projects with design depths of –12 feet or less, and with average annual dredging volumes of 50,000 cy or less. Between 1991 and 1997, an average of approximately 250,000 cy has been generated each year by small dredgers (see Table 6.5-1). Furthermore, the actual volume has remained fairly constant each year. Therefore, 250,000 cy per of the overall in-Bay disposal volume limit at any time will be “set aside” for small dredger projects (see Figure 6.5-1). This means, for example, that of the initial 2.8 mcy per year overall in-Bay disposal volume limit, 2.55 mcy per year would be available for “medium dredger” projects and COE maintenance dredging. Small dredgers will be assumed to use the full set-aside volume each year. Even if they actually dispose of less than 250,000 cy in a given year, the “extra” disposal allocation will not be transferred to medium dredgers or the COE. Conversely, if the small dredgers dispose of somewhat more that their 250,000 cy set-aside in any year, that year’s allocation to medium dredgers and the COE will not be reduced. In other words, an overall allowance is made for the average disposal volume of small dredgers as a group, but beyond that they will generally be exempt individually from any in-Bay disposal allocations. Given their small volumes individually and cumulatively, this exemption should not significantly affect in-Bay disposal volumes in any year. (However, no project proponent, including small dredgers, will be allowed to dispose in the Bay if UWR or ocean disposal alternatives are practicable for them.) Unlike for other dredgers, the small dredger set-aside volume will not be decreased over time during the transition period. This small dredger set-aside is common to all the potential implementation strategies discussed in the following sections.

### *Contingency Volume*

During each dredging and disposal allocation period (the duration of the allocation period varies among the five potential implementation strategies discussed in the following sections), an additional volume of 300,000 cy will be available at the in-Bay disposal sites to accommodate emergency dredging and other unforeseen situations (see Figure 6.5-1). This “contingency volume” is separate from the overall disposal site volume limits, and independent of any specific dredger allocations or the small dredger set-aside. This 300,000 cy overall contingency volume applies to the in-Bay sites as a whole (i.e., it is not 300,000 cy for each in-Bay site). It would not be available for routine projects proposing to dispose at in-Bay sites, and would not be allocated by the LTMS agencies except under specific circumstances of over-riding public interest, to be defined in the LTMS Management Plan. This contingency allotment is common to all the potential implementation strategies discussed in the following sections.

### *Site Monitoring Disposal Fees*

Disposal fees would require state legislative action to implement. Such fees would be assessed on in-Bay disposal, and administered to monitor and manage in-Bay disposal sites. The fees likely would vary according to disposal volume with “small dredgers” and others with smaller volumes paying lower fees per cubic yard than those disposing of larger volumes. The fee would thus be proportional to the level of use and potential for impacts. Fees would be used for in-Bay disposal site monitoring and management, and potentially to subsidize or help support the development of practicable beneficial reuse alternatives. The assumption that there would be an in-Bay disposal fee is common to all the potential implementation strategies discussed below.

The following sections present five potential strategies for allocating in-Bay disposal volume among the "medium dredgers" and COE maintenance dredging. As noted above, all these options include a small dredger set-aside, a small "contingency volume" for unforeseen situations, and the assumption that in-Bay disposal fees of some kind would be assessed. These options will be discussed further through the LTMS Management Plan development process, and the Bay Plan and Basin Plan amendment processes, each of which will provide opportunity for public review and comment.

### 6.5.7.1 Strategy 1 — 3-Year Allotments with "Banking" and "Trading" Allowed

This option allows both "banking" and "trading" of the in-Bay disposal volume allotments that would be made to individual dredgers.

Banking means that a dredger who has been given a certain in-Bay disposal volume allotment for the year, but who does not need to dredge as much as has been allotted, may carry forward any unused portion of his or her allotment to a subsequent year within the same allotment period. (Banking can therefore apply only in strategies where multi-year allotments are given.) This provides the dredger with flexibility to dredge when and how much is needed (annual allocations are made based on a dredger's average dredging history, but many projects do not dredge every year, or need to dredge different amounts in different years). Note that in no case may banking result in the overall annual limit for an in-Bay disposal site to be exceeded; therefore proposed banking of allotments must in all cases be coordinated with the LTMS agencies through the DMMO. Also, banking does not eliminate the need for the party receiving the allotment to establish whether there are practicable alternatives to in-Bay disposal for that project.

Trading means that a dredger who does not need to dredge as much as has been allotted, may at his or her discretion transfer the remaining volume of the allotment *to another dredger* who does not otherwise hold a sufficient allotment. The exchanges may be simple transfers, or trades for volume from a future year's allotment, or trades for other considerations (allotted volume may be marketed). However, trades must in all cases be coordinated with the LTMS agencies through the DMMO. Also, trading does not eliminate the need for the party receiving the allotment to establish whether there are practicable alternatives to in-Bay disposal for that project.

As described in sections 6.5.4 and 6.5.5, overall in-Bay disposal volume limits will be reduced every 3 years during the transition period. Under this strategy option, dredgers will be given 3 years' worth of annual allotments at the beginning of each 3-year period, for use at any time during the period (provided that overall annual disposal volume limits at any in-Bay disposal site would not be exceeded).

For example, at the beginning of the transition to Alternative 3, each "medium dredger" and COE dredging project would receive an allotment (of the total 2.8 mcy per year allowable in-Bay disposal volume) equal to three times their annual in-Bay disposal volume allocation (as calculated by the midpoint between their 7-year average and 7-year maximum volumes — see Table 6.5-1). In each subsequent 3-year period the overall annual in-Bay disposal volume would be reduced by 380,000 cy, and individual dredger's allotments would also be reduced proportionately. This process would continue throughout the transition period. As noted earlier, individual small dredgers are exempt from this allocation system.

Once a project sponsor uses its total in-Bay disposal volume allocation, no dredged material from its subsequent dredging episodes could be disposed in the Bay during that allocation period unless an additional unused allocation is obtained by trading with another dredger. Instead, alternative disposal options would need to be used or further dredging would have to be deferred until the next 3-year allocation period. Note that all dredgers would still be required to determine whether UWR and ocean disposal alternatives may be practicable, as a part of the permit application process to the DMMO.

### 6.5.7.2 Strategy 2 — 3-Year Allotments with "Banking" and "Trading" Allowed and a Fixed Overall Yearly Disposal Cap

This alternative would be identical to Strategy 1 with the exception that the overall in-Bay disposal limit would not decrease over time as the in-Bay allotments are decreased. This would allow greater flexibility to dredgers and greater volumes of dredged material to be disposed at in-Bay sites in any given year. However, as the allotments to dredgers would decrease over time, so would in-Bay disposal decrease toward the Alternative 3 disposal goal. The overall disposal limit could be set as low as the 2.8 mcy per year starting volume, or as high as the current in-Bay disposal targets. This strategy will effectively allow dredgers to use their entire allotment in any given year of the allotment period as long as the disposal limit for the year is not exceeded.

### 6.5.7.3 Strategy 3 — 1-Year Allotments with Trading Allowed

This option differs from Strategy 1 in that only 1-year allotments would be given. Therefore individual dredgers could not by themselves "bank" their allotment from one year in order to conduct a larger volume of dredging in a subsequent year. Nevertheless, dredgers would still be allowed to trade or market any unused portion of their year's allotment to other dredgers. Since these trades could be made in exchange for future year allotments, trading among dredgers could be carried out so as to have the same effect as banking by an individual dredger (though via a more complicated process). Otherwise, annual allotments would be calculated in the same manner as described for Strategy 1 (see Table 6.5-1). Similarly, the annual allotments would be reduced every 3 years in the same manner as described under Strategy 1.

Once a project sponsor uses its annual in-Bay disposal volume allocation, no dredged material from its subsequent dredging episodes could be disposed in the Bay that year unless an additional unused allocation is obtained by trading with another dredger. Instead, alternative disposal options would need to be used or further dredging would have to be deferred until the next year. Note that trading may not result in the exceedance of the overall annual disposal volume limit for any in-Bay site. Also, trading does not eliminate the need for the party receiving the allotment to establish whether there are practicable alternatives to in-Bay disposal for that project. Therefore, trades must in all cases be coordinated with the LTMS agencies through the DMMO. As noted earlier, individual small dredgers are exempt from this allocation system.

### 6.5.7.4 Strategy 4 — First-Come, First-Served

Under the first-come, first-served strategy, "medium dredger" and COE projects would not receive individual allotments on either an annual or multi-year basis. Instead, dredgers would have the opportunity to apply for disposal of dredged material at in-Bay sites until the annual disposal volume limit for each in-Bay site is met. Approval for disposal would occur on a first-come, first-served basis as determined by the date of agency approval of the permit or dredging episode. Consequently, dredgers intending to dispose in-Bay after disposal volume limits had been reached would need to find alternative disposal options, or defer dredging until the next year.

Note that all dredgers must still establish whether there are practicable alternatives to in-Bay disposal for their project. Also, individual small dredgers are exempt from this allocation system, and their ability to dredge and dispose would not be affected by the date of their project approval.

Also note that in-Bay disposal allocation during initial implementation of the transition period (prior to completion of the LTMS Management Plan and the Bay Plan and Basin Plan amendment processes) will be on a first-come, first-served basis as described here (see section 6.5.2).

### 6.5.7.5 Strategy 5 — Reduced In-Bay Disposal of COE Maintenance Material Only

Based on data from 1991-1997, the highest annual maintenance volume dredged by the COE was approximately 2.0 mcy, which occurred in 1993. During the same period, the highest annual maintenance volume dredged by "medium dredgers" was 970,000 cy, while the highest annual maintenance volume dredged by small dredgers was approximately 300,000 cy (see Table 6.5-1). Given these numbers, it is apparent that the long-term LTMS goals could be substantially achieved if all COE maintenance dredged material was placed at alternative sites, even if all other dredgers continue to use in-Bay disposal sites as in the past. (The maximum maintenance volume shown above for medium plus small dredgers — 1.27 mcy — approximates the long-term annual in-Bay disposal volume limit of 1.25 mcy.)

Although under this strategy access to in-Bay disposal capacity would likely be less restricted compared to the other strategies discussed, dredgers would still be required to establish whether UWR and ocean disposal alternatives may be practicable, as a part of the permit application process reviewed by the DMMO.

Note that implementation of this strategy would minimize direct economic effects to local dredgers.

However, it would mean that the federal government (i.e., the Harbor Maintenance Trust Fund) would be carrying a significant portion of the financial burden of using alternative disposal practices to achieve the LTMS goals.  Legislative changes would likely be needed to provide the new federal and state (for cost-sharing purposes) funding needed for this option.